THE JOURNAL OF GAS LIGHTING
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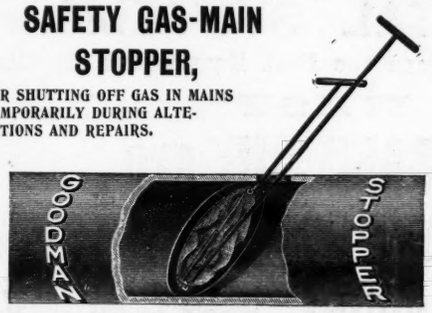

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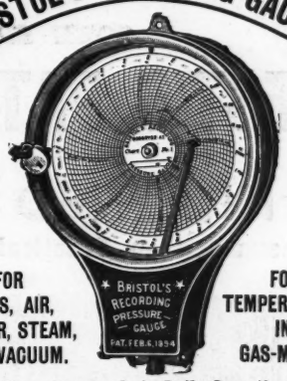

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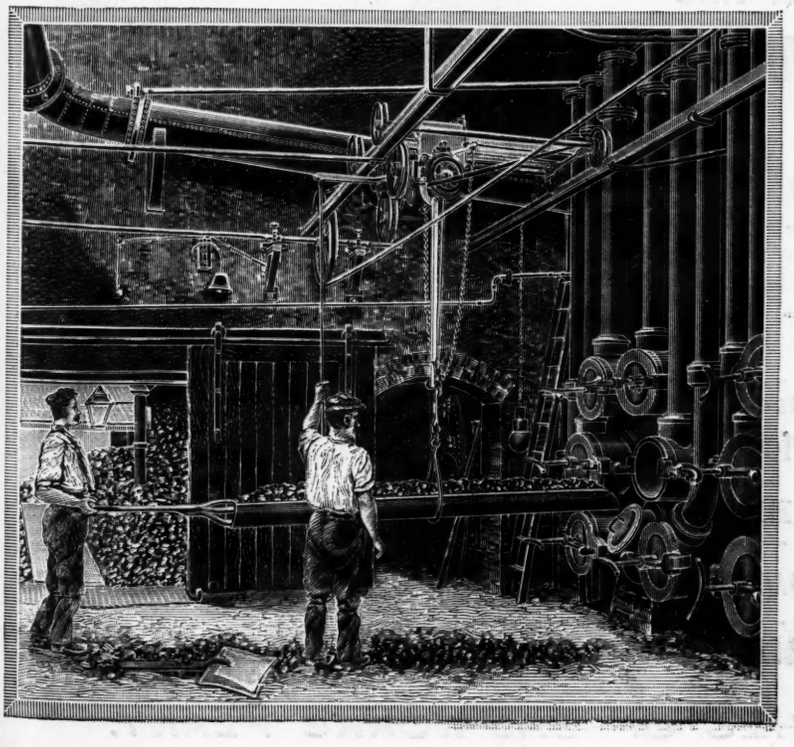

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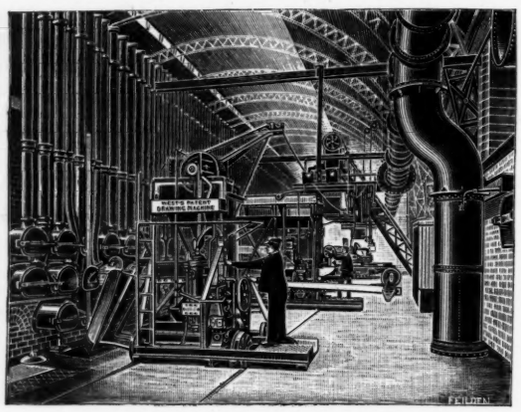

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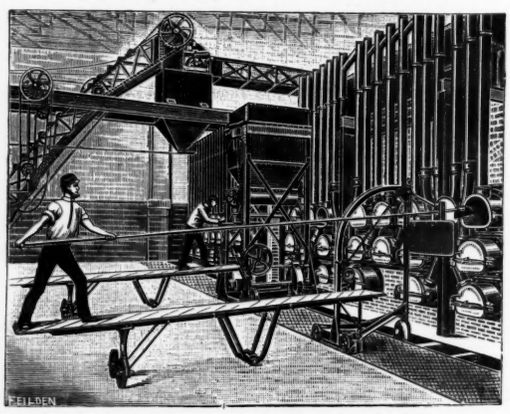

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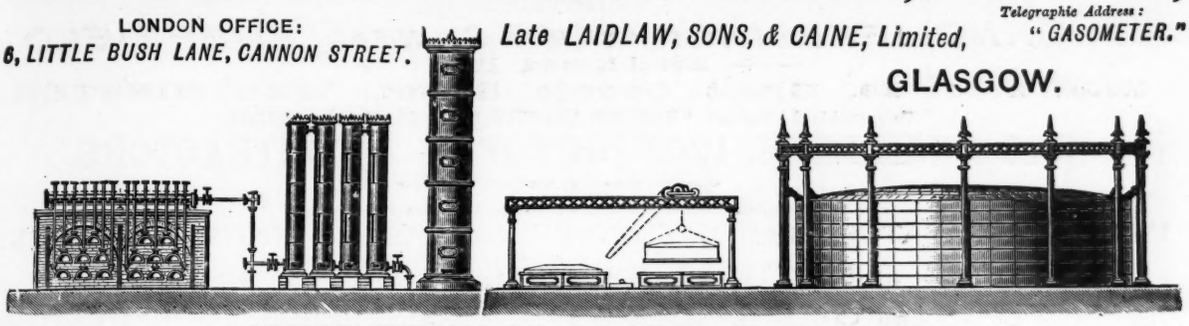

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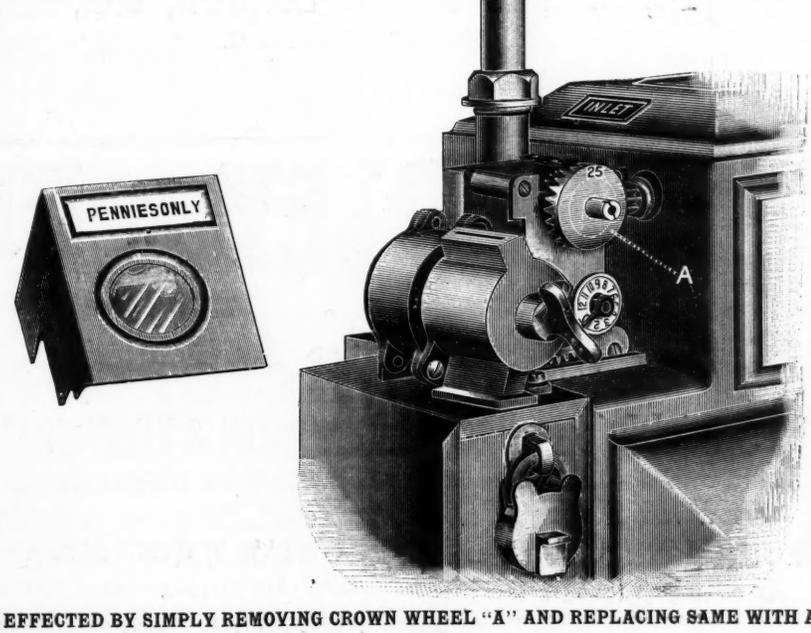

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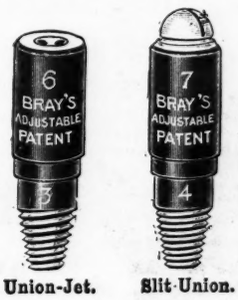

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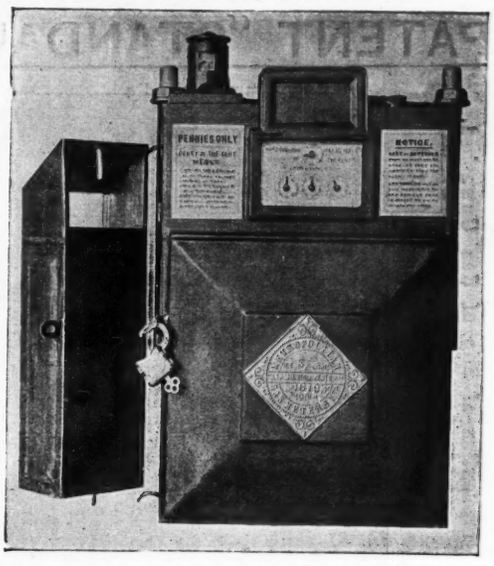

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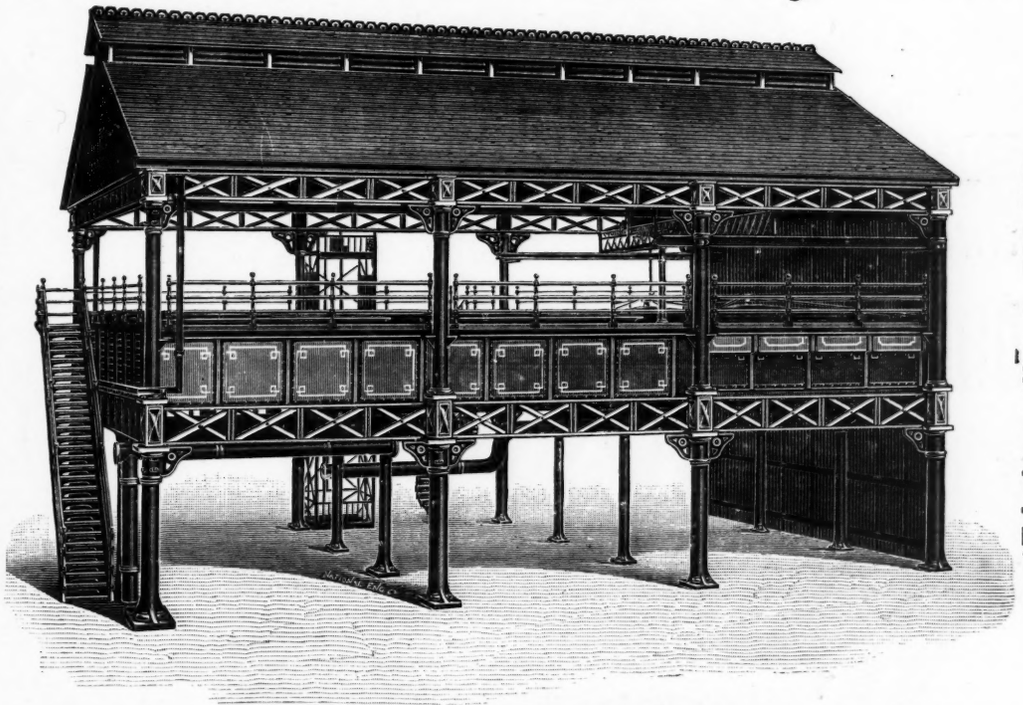

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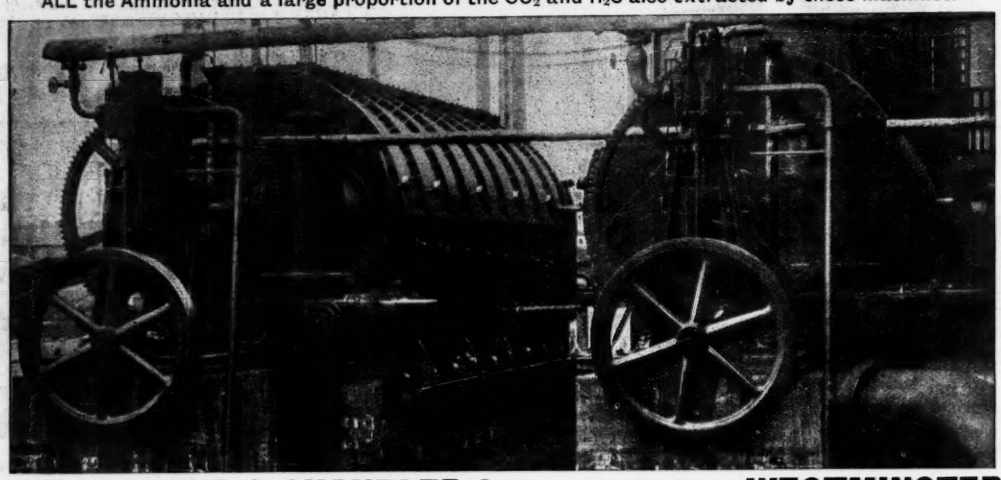

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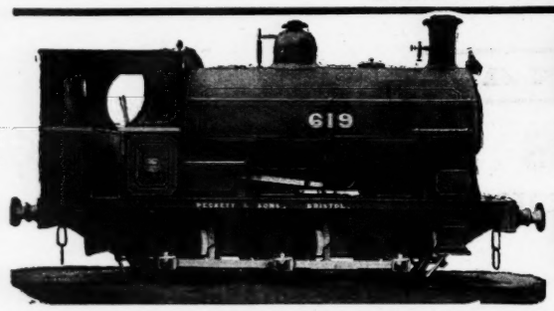

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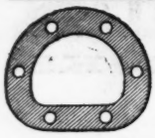

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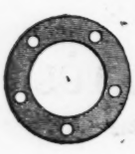

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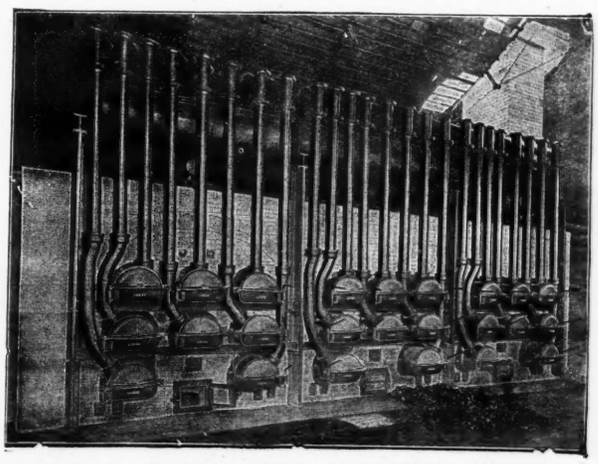

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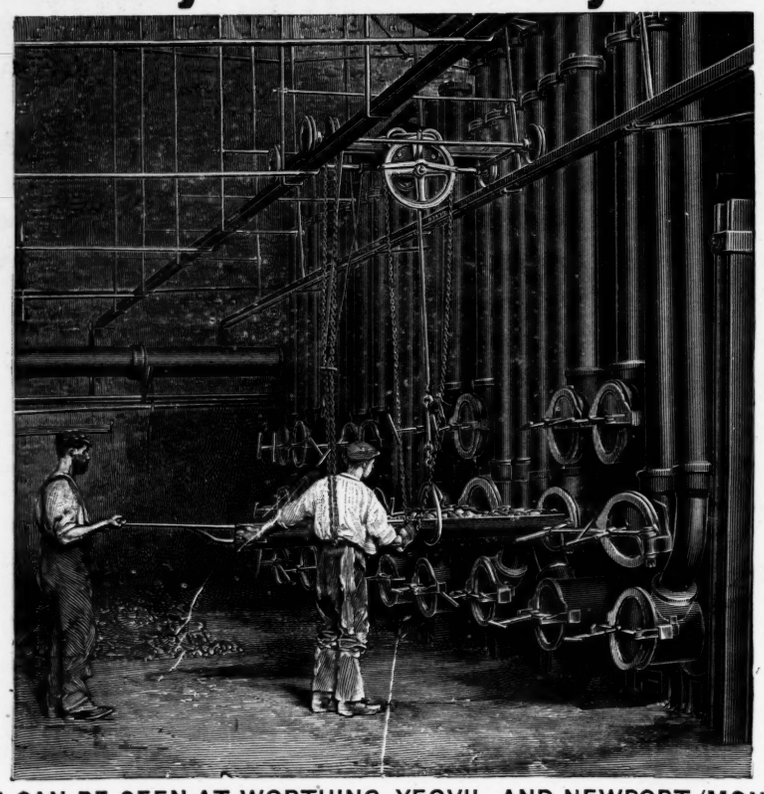

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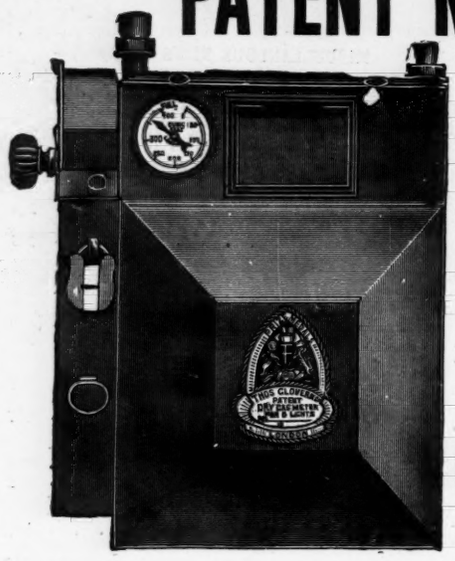

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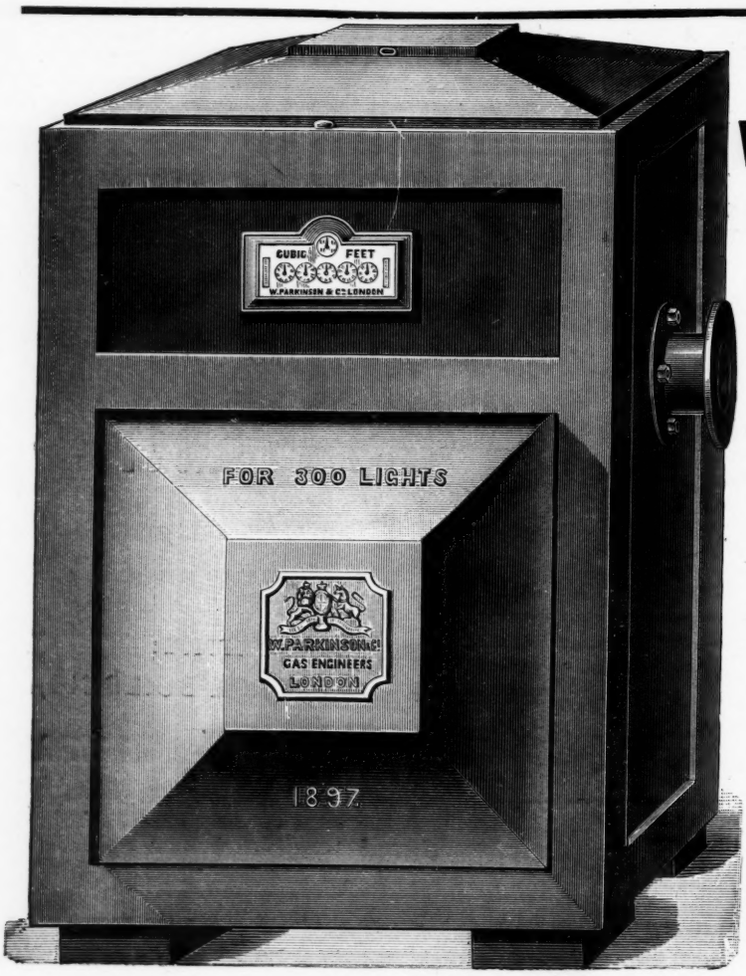

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VOL. LXXVIII., No. 2004.—TUESDAY, OCTOBER 8, 1901.

EDITORIAL NOTES.

Meeting of the Commercial Gas Company—A Fresh Start.

THE meeting of the Commercial Gas Company on Thursday was unusually replete with interest. Those proprietors who saw in Mr. Bradshaw, on his first appearance in this capacity, a welcome reinforcement of the class of gas company chairmen who really know their business and address themselves to it, can now rest assured that the expectation was fully justified. For Mr. Bradshaw is not only an excellent speaker (he might be that, and still a nonentity in the gas industry), but he is evidently very much more than a voice for expressing the sentiments of an Executive. In the circumstances, the Chairman is to be congratulated upon the occurrence, so shortly after his election, of some very critical turning-points in the history of the undertaking; while the Company are fortunate in finding a Chairman who is no mere figure-head. These are times when an important Gas Company need a leader to act and talk like a man of affairs. What with electric lighting on the one hand, and Municipalism on the other, it is puerile in a gas director to imagine that the business is to be administered, and the dividends gathered, automatically.

Mr. Bradshaw's explanation of the policy which had guided the Commercial Board in determining the figure by which the price of gas should be raised, when coal became so dear, was of a statesmanlike character; and he was quite justified in claiming for the rewards of this wise moderation the satisfactory results which he enumerated. The most generally interesting of Mr. Bradshaw's revelations, however, were his account of the successful introduction of profit-sharing for the benefit of the workmen of the Company, and his notice of the intention of the Board to prepare a Bill for next session. Many ears will prick up over the latter announcement. From the Chairman's hints, it may be gathered that the Bill will be drafted in general conformity with the recommendations of Sir James Rankin's Committee, with the addition of a reduction of the standard illuminating power. This programme is very engaging. The gas supply of London, and the workers for whom it affords employment, are evidently in the way of improvement, where the directorate is alive.

The Eastern Counties Meeting.

MANY folks regard the Eastern Counties as a flat and uninteresting tract of the country; and the farther one gets away from it, the idea seems to become more prevalent that the people in the district might be described in the same terms. How such a misunderstanding arose, we have no knowledge; but certainly a more pronounced mistake was never made. However, the view being held, it may be surmised the holders imagine that out of the Eastern Counties no good thing can come. But in this again they err, if so they think; and an acquaintance with the Eastern Counties Gas Managers' Association would clearly prove them to be wrong. The Association has now been in existence thirteen years; and during that brief period the technical product (obtained entirely from within) has been of a quality that will bear comparison with most of the other district organizations. By their half-yearly meeting at Cambridge on Thursday, under the presidency of Mr. Richard Brown, they further enriched their transactions. The President is the Engineer of the local Gas Company; and his Chairman and Directors identified themselves in a bountiful way with the meeting—testifying to Mr. Brown's colleagues their high appreciation of their chief official and of the good work which he has done for them. Most of the members have had more than one opportunity of inspecting the Company's plant; and each time they have seen the process of evolution being steadily pushed forward, until a few months hence the works will stand among the most modern equipped in the country. Mr. Brown has proved himself an Engineer of progressive ideas; and moreover he has had the encouragement of a Board who are persuaded of the truth that, in gas manufacture, as in other industries, the greatest economy and the most effective achievement are to be obtained by the use of some of the best of modern inventions, with a good manipulator at the back of them.

The address delivered by the President was written in a thoughtful vein. He is strongly impressed with the necessity of applying labour-saving machinery to the utmost, in order to reduce carbonizing expenses; and he is about to put his views into practice in full measure. On the disputed point as to the relative efficiency of coke dragging and carrying conveyors, careful reflection has led him to pronounce for the latter system. A feature of the address is the succinct description which he gives of the Mond system of gas production; but in reading this part of the President's composition, it must not be overlooked that the information was supplied to him by Mr. H. A. Humphrey, of Messrs. Brunner, Mond, and Co., and was not obtained by personal investigation. In saying this, we do not intend to asperse by one iota Mr. Humphrey's *bona fides;* but it is quite natural—and this is a fair remark to make—that the best that can be said for the system would be said by that gentleman. However, in Mond gas as a competitor, the President does not see any cause for alarm. Instead of regarding it as a menace to the development of the present gas industry in one particular branch, it appears to Mr. Brown more in the light of a "blessing in disguise." But his reason does not appeal to us as a sufficiently substantial one. He seems to find cause for exultation in the prospect of this power gas largely supplanting steam in manufacturing districts, because "by "its adoption manufacturers will be able to reduce the cost "of producing the numerous materials that we require in "our undertakings." Situated at Cambridge, where he is never likely to be disturbed by the competition of power gas, it is very easy for Mr. Brown to take this light view of the matter. But let him transfer himself into the position of a gas manager in a large industrial centre, and we fancy he would then prefer to see his own supply, rather than the so-called power gas, supplanting steam as a motive force. It is not so much perhaps present business that the supply of power gas would affect. But, in view of the fact that everything is inclining to the production of cheaper gas in the future, it is the repression of the expansion of existing undertakings in one promising direction that has to be considered; and this outlet for development has to be defended. His light-hearted view notwithstanding, Mr. Brown himself later in the address—when speaking of the electric light and "other possible competitors"—adjures the gas manager not to refuse to face unpleasant facts, but to seek in every possible way to discover further means of cheapening the cost of their production. It is this cheapening which Mr. Brown so keenly urges that will enable the gas manager to do what the power gas people claim they can accomplish more economically than existing gas undertakings at present prices.

But leaving the address and turning to the papers submitted to the meeting for discussion. There were two. One was by Mr. W. J. Carpenter; and in it he described the coal unloading and stoking machinery which he has installed at the Yarmouth Gas-Works. The other contribution was by Mr. E. W. Smith, of Chelmsford; and he put into words and figures the results of the improvement in carbonization during recent years. Both papers are useful additions to the proceedings of the Association. In his communication, Mr. Carpenter explained the circumstances under which he adopted the coal-handling and retort-stoking plant that he described. The circumstances are peculiar to Yarmouth, and the methods adopted under those conditions, and the financial results, point to good engineering. The application of power machinery in a house containing only twelve settings is a noteworthy point. Mr. Smith put into a new dress the advocacy for the supplanting of old and direct-fired retort-settings by the more modern and scientific systems of heating. At this time of day, there are few gas managers who require to be told of the benefits to be derived from the regenerative system; but there are still many (we except those burdened by insurmountable conditions) who, from sheer indifference or a false fear in respect of expenditure, cling to old and wasteful methods. Some such are to be found in East Anglia. Mr. Smith put his argument in an instructive way; and therefore we welcome his paper, and hope it will

have the good effect intended by him. That the benefits of gaseous firing can be advantageously applied to works low down in the scale of size was illustrated by Mr. J. Barton. The discussion also brought before the members for the first time the last new-comer to the district—Mr. Thomas Glover, who will be a decided acquisition to the debating power of the Association. On this occasion, eight new members and two associates were elected; so altogether the Association is to-day as strong and active as it has ever been.

Mr. Dunn's Address at the North of England Meeting.

THE address with which Mr. Matt. Dunn inaugurated his presidency of the North of England Gas Managers' Association last Saturday is one of those comprehensive compositions which tell of a strict surveillance on the part of the author over contemporaneous doings in the gas industry. Ancient history has no part in it; and there is no appeal to official statistics to supply the place of the original ideas and thought which one looks for, but does not always find, in presidential utterances. The Association have suffered during the last year or two from a lack of technical matter for discussion; but here we have, in this one address, from one member's pen, sufficient material, and sufficient freshness in the method of treatment, to have formed the groundwork for half-a-dozen or more interesting discussions. If the members are without a topic for consideration at their next meeting, let them take the portion of the address commencing with "The Gas of the Future" and ending with the President's suggestive observations on "Coke-Ovens;" and, if the members are given due notice, we have no hesitation in saying that a healthy debate would be placed on record.

We cannot here pass in review all the subjects which the ready pen and fertile brain of the President pressed into the address; but there are a few points on which we may bestow a little attention, if only the more to interest our readers in the address itself. Quite early in the address, Mr. Dunn has something to say on the mischief which is wrought throughout the country by the pernicious cutting of coke prices, which, from reports that reach us, appears to be a growing evil. Only a couple of days before Mr. Dunn was inveighing against the system, the President of the Gas Institute (Mr. S. W. Durkin) was telling, in doleful tone, at the Eastern Counties meeting, how a good local market for coke at Southampton was being spoilt by outside competition. It is a question worth immediate consideration how best to meet these external attacks. A praiseworthy effort is being made by members of the North of England Association—but independently of the organization—to do something to maintain their coke prices. But we are afraid that where there is not a concurrence of effort among gas undertakings over a large district, the result will hardly repay the time and trouble of the few who may be willing to act in concert. In the case of the North of England Association, it was suggested in the early part of the year that the issue of a monthly coke-list, containing the prices and stocks of the various works in the district, would be an advantage to the members; but, a project of this kind being outside the objects of the Association, it was determined to see what could be done from without. A circular was issued to the Managers of the principal works in the district, asking them to contribute; but even in such an extensive area as that embraced by the Association, only fifteen Gas Companies and Local Authorities responded favourably. The first list was sent out in July to those who contribute to it. Mr. Dunn now informs us that "some of the larger Companies have "not consented to join." It is just in the want of adhesion of the large concerns that any such scheme will be rendered little better than futile. And really their position is quite understandable. They have no monopoly in the sale of their coke, as in the case of gas. In the former commodity they are open to the competition of all comers; and, being large producers, they require a free hand in the disposal of their make. The revelation that they have a large or short stock might be used by some unscrupulous dealers to their disadvantage. Just as well might one expect that the large cotton mills, say, would give to competing mills an account of their purchases, prices, contracts, and stocks.

We recognize a considerable difference between cutting prices and a free market at a fair price. But the first question is how to maintain a fairly uniform price without divulging information which no commercial house would think of giving away; the second and more pressing one is how to counteract the evil of cutting prices. Both are difficult problems; but a successful method of dealing with the second would aid in no small measure to secure the first. In other branches of commerce, it is found that the only effectual way of crushing cutting competition is by meeting it with its own kind. A gas undertaking with no freight to pay could, by a temporary shedding of profit on its production of coke, do its part in suppressing mischievous extramural competition. This, of course, would not be sufficient to effect a permanent cure. But could not something further be done by gas suppliers throughout the country who deprecate such unfair procedure as the selling of coke at a lower price beyond the area of an undertaking's gas supply than within it? Could not those suppliers combine for the suppression of such tactics, and adopt some method of retaliation? In this way: When a concern was found offending, then the nearest undertakings in the combination should flood that concern's local market with coke at a lower price than there obtains. We have an idea that if something of the kind could be done, the aggressor would soon beat a retreat, and keep within the bounds of a fair market value. This possibly is an immature suggestion; but there may be in it a seed worth developing. If anyone, however, has a better idea, let him suggest it; we shall be happy to support it. Acute diseases, as a rule, require sharp treatment; and here we have an evil which must be trenchantly dealt with.

Mr. Dunn's address in another part exemplifies the uncertainty that exists beyond the horizon as to the future of the gas industry in regard to the method of production. Everything, as Mr. George Livesey recently said, seems to be tending in the direction of a departure from the present practice in manufacture. The uses of, and the methods of using, gas are extending and changing; and a cheaper gas of a different quality from the requirement of the past is now wanted. But engineers are adrift in their views as to what the future will bring forth; and Mr. Dunn is an example of the current indecision. In one place he says: "If the "future of the gas industry is to be, as many believe, in the "direction of heating and power, it would seem that the "invention of Dr. Mond bids fair to be *the one most likely to* "*succeed*—making, as it does, a gas of very even quality of "the producer and water-gas type." Then, later on, he goes over to another system. In dealing with the question of coke-ovens, he remarks: "Whatever system may be "ultimately adopted, it would certainly seem probable that "*some modification of the coke-oven method will come into use in* "*the future for gas-making purposes*—if not in small-works, "then certainly in large ones." It is clear that Mr. Dunn is convinced, like many other observant gas engineers, that a change in gas methods is looming in the distance; but it is equally clear from his quoted observations that he is, like many others, a little hazy in his mind as to the precise direction in which the change is to be sought. In this part of his address, he offers suggestions that, as we have already said, are open for examination and controversy.

A reference is also made to Professor Lewes's Engineering Congress paper on the "Utilization of Water Gas in the "Destructive Distillation of Coal;" and here, we fancy, Mr. Dunn has made a slip, which it is well should be corrected, in order that readers of the address may not be misinformed. The President says it will be necessary for us to know "what quantity of blue water gas must be introduced "into the coal-gas retorts, and at what time this must be "inserted. . . . Unfortunately, the tests at Sydenham "do not answer the question, which it would seem is a very "important one." We are afraid Mr. Dunn has not studied the Professor's tabulated statements with due care. If he consults Table I. on p. 627 of the "JOURNAL" for Sept. 10, he will find a very complete answer to his point. From the data there presented, he will be able to judge for himself the best percentage of water gas to be admitted into the retorts, the time to admit it, and the duration, in order to realize the best results.

There is one other matter in the address which we should like to see put right. It is where the President alludes to the use of gas-producers separate from the retort-benches. There he observes: "Mr. C. C. Carpenter has been a great "advocate of this system of separate producers. . . . "He has not only advocated these, but he has had the "courage of his convictions, as shown by the arrangement "at the Old Kent Road." We are sure Mr. Dunn would not wittingly do an injustice, and equally sure that Mr. Carpenter (who has admittedly done good work in, and has been a strong advocate of, this departure) would not like to see the labours of his late chief, Mr. Frank Livesey, drop out of recognition. Mr. Carpenter described this innovation

in carbonizing plant at the meeting of the Southern Association towards the end of 1897, and in his paper stated that Mr. Frank Livesey "had designed and erected at the Old "Kent Road several installations of the type described;" and during the discussion, Mr. Livesey himself made a statement on the subject. That paper and the discussion are well worth re-perusal to-day.

We have not commented on these last two points in the way of stricture, but merely because we think that a little emendation in connection with them will add to the value of what is an exceptionally good review of present-day affairs in the gas industry. We cannot conclude without a complimentary word to Mr. Dunn on the excellence of the results which have been achieved at Goole since the gas undertaking there came under his charge.

The Miners' Conference.

THE outstanding feature of the annual conference of the Miners' Federation of Great Britain, held at Birmingham last week, was the aggressive, anti-capitalistic, tone of the address delivered by the President, Mr. B. Pickard, M.P. If it were his desire to stir up in his hearers' hearts feelings of antagonism against their employers, and to destroy any desire of those employers to deal in an amicable and conciliatory spirit with their men, he may be congratulated upon achieving a large measure of success. What is to be said of a man who is the responsible leader of some 350,000 miners, and should, to be worthy of the position, be essentially a moderator, not an inflamer, of passions, who is found declaring that "in every department, employers of labour "are like the horse-leech—the more blood they get, the more "they ask for," and who has the temerity to put before the men fables such as the following, without, be it noted, attesting, but leaving his hearers to assume, their truth? "When they were told," Mr. Pickard is reported to have said, "that employers made 99 per cent. and gave a bonus "of 50 per cent. on the capital laid out, it was enough to "stagger their idea of political economy to hear that certain "districts were asking for reductions of wages. They had "heard also of some men far north making as much as "nearly £2,000,000 in one year, and quietly pocketing "reductions in miners' wages." "They had heard"—"they were told." Why did not Mr. Pickard give chapter and verse, if he had it? If he had not, what business had he to put forward hearsay statements calculated to embitter the relations between masters and men?

After making these insinuations as to the fabulous profits of the owners, and patting himself on the back for having been the first to put the idea of a "living wage" into concrete form, the President proceeded to refer to the Taff Vale case, the judgment in which, he declared, "only applied where "anybody was authorized to attack and intimidate by "violence and show of force. So they must see that the "rules were so framed that no official could do wrong." If the Miners' Federation imagine that only persons specifically "authorized" by the Union to use or threaten violence come within the scope of the House of Lords judgment, they are living in a "Fool's Paradise," and will, unless they are very careful, have some day a very unpleasant awakening. Then followed the inevitable reference to the eight-hour question, as to which the President was frank enough to say that he thought the day had come when the conference must make up its mind to have it "by hook or by crook." The Bill promoted by the Federation having been defeated "by "Capitalist and Labour members," the question for the conference was whether a ballot of the men should be taken as to handing in notices, in order to obtain the shorter day by means of the threat of a general strike—the policy always advocated by Mr. Pickard. A less, but sufficiently menacing, resolution was, however, adopted; the Executive Committee being instructed to approach the coalowners on the question, and, failing a satisfactory agreement by conciliatory means, to convene a conference to further consider the matter. If the miners definitely determine to strike if they do not get the eight-hour day, we are afraid there will be a strike.

Following upon a reference to the question of foreign labour in the mines—to which the objection urged is always the risk of accident, never the fact that the foreigners will take less wages—came the consideration of the grandiose scheme for increasing the number of Labour Members of Parliament, for the achievement of which Mr. Pickard appears to imagine that only money and determination are needed. The miners (or rather their representatives) have therefore decided upon levying a toll of 1s. per head per annum on the members of the Federation, to create a fund for this purpose. Curiously enough, Mr. Smillie, who was present as one of the delegates from Scotland, did not take any part in the discussion. That was a pity, as he might have explained to the conference, after his recent experience as a candidate for parliamentary honours, some of the difficulties in the way of becoming a Labour Member. One of them is that of getting people with old-fashioned ideas of Liberalism and political economy to vote for socialistic anti-capitalists. We venture to think that no amount of money will ever get "70 or 100" gentlemen of that kidney into the House of Commons. And this is, apparently, the view of Mr. Sam Woods, M.P., who remarked that the difficulty of arranging constituencies in which to run their candidates struck him forcibly. "He seriously deplored the fact that "the most democratic divisions where their men predomi-"nated were represented by the biggest capitalists to be "found in the country." That is, to those who are anxious not to see a hard line drawn between the classes and the masses, and who wish the government of the country to be in the hands of experienced and educated men, a most satisfactory state of affairs, and goes to show that the men have more sense than, and by no means unlimited confidence in, the gentry who are so fond of posing as the leaders of the democracy.

The other matters dealt with at the conference—old-age pensions, child labour, workmen's compensation, &c.—do not call for any special comment.

A New Coalfield in Kent.

THE cores which were last week raised, by means of the calyx drill, from below No. 2 shaft of the Kent Colliery works, have for all time set at rest a question which for very many years past has exercised the minds of geologists—namely, whether coal in any considerable quantities existed in the South-East of England. As far back as 1856, Mr. Godwin-Austin communicated a paper to the Geological Society of London upon the "Possible Extension of the "Coal Measures beneath the South-East Part of England;" but it was not until after the closing of the Channel Tunnel works in the year 1882 that any serious attempt was made to substantiate the theories which had previously been put forward. At that time, Mr. Francis Brady, M.Inst.C.E., the Engineer to the Channel Tunnel, conceived the idea of making a trial boring east of the Shakespeare Cliff and the tunnel; and this was afterwards carried out, though the results apparently left many people unconvinced. First a Syndicate and afterwards a Company were formed to develop the field; but, owing to the financial methods adopted, the venture was for some years utterly discredited. Indeed, affairs seemed almost hopeless when Mr. Florence O'Driscoll some time ago took charge of the operations. Since then, the work has been pushed on with all speed, with the result that two seams of coal, 18 inches apart, have been struck at a depth of between 1100 and 1200 feet from the surface.

The questions now to be decided are the quality of the coal and whether or not it will pay to mine it. The core brought to bank from the first seam was reported to be "good, bright bituminous household coal." This would seem to settle one point; and seeing that the first seam struck is 2 feet thick, while in Northumberland and Durham seams of less thickness are being remuneratively worked, the second question would appear to be in a fair way to being answered in the affirmative. The quality of the coal will, however, be fully investigated by Professor Etheridge when the complete core has been taken out. The next important seam proved by the original Brady boring (which was 150 feet distant from the present shaft) is 2 ft. 6 in. thick, at the 1500 feet level; and at a depth of some 2200 feet Mr. Brady came on a 4-foot seam. No doubt the reaching of this latter seam will be the ultimate object of the Corporation. Even though the coal should not be of use for gas-making purposes, the enterprise now in course of development must be of the greatest moment to our industry—as it will be to every other. If the question of the conservation of the known British coal supplies is of importance, how much more so is that of the opening up of altogether new fields? Should the collieries prove to be a payable commercial proposition, it would be quite hopeless to try to imagine the effect that will be produced on the South of England. We await the further outcome of affairs in the sincere hope that the nation is about to receive the enormous addition to its wealth with which the successful opening up of the Kentish coalfield would endow it.

WATER AFFAIRS.

The Recent Drought and its Lessons.

In view of the details given in another column in regard to the effect of the protracted drought with which the North of England has been visited, it is no exaggeration to say that some of the most important manufacturing centres of the country have been, and are still, passing through a crisis unexampled in their history. For something like four months, committees and officials responsible for keeping up a supply of water watched with daily increasing anxiety the gradual lowering of their stores, and looked in vain for the "little "cloud" betokening early replenishment of the reservoirs. They saw these great receptacles slowly emptied, until dwellings which had been submerged in their construction were once more brought to light, and animals were seen grazing on spots which for years had not been trodden by human foot. And no wonder, seeing that in the Manchester district, which is not a proverbially dry one, only 8½ inches of rain fell during the above-named period, instead of the 18 inches which usually descend in the summer months. Bearing in mind the fact that an inch of rain falling on an acre of surface corresponds to nearly 22,500 gallons of water deposited thereon, it is not difficult to realize the effect of the diminished rainfall shown by the figures just cited. To the residents in the district, it has been all too apparent. The Lancashire capital, with its extensive manufactories and its 544,000 of population, has been reduced to a bare 21 days' supply of water, notwithstanding the imposition of a restricted service and with Thirlmere at its back. The water in store at Leeds, unless it is largely added to, will not last so long; while at Heywood it will be exhausted in about a fortnight. At Huddersfield, the service has been curtailed to four hours a day; and at the close of the past week it was hinted by the Chairman of the Water Committee of the Corporation that even this meagre supply might have to be further reduced to the extent of one-half. Assistance is being afforded by a local firm of brewers, who possess an unfailing supply of good water, which they have most generously placed at the disposal of the inhabitants of Lockwood for use for drinking and culinary purposes. The stoppage of mills resulting from the drought has necessarily seriously affected both employers and operatives; and at Nelson, the attempts of certain millowners to secure for themselves water from the Walverden stream, to the detriment of other owners below, led to the destruction of the weirs, and to disturbances which closely approached a riot. Fortunately, further trouble was averted by the Corporation coming to an arrangement whereby each mill should receive a fair share of the water available.

It is unnecessary to cite other instances of the troubles arising from the restricted water supply which the prolonged drought in the North—for Edinburgh has also been seriously affected by it—has entailed. The point to be considered is how they are to be obviated in the future; for it is not to be supposed that the country will not again be subjected to a similar, or even more severe, visitation. It is obvious that the only way by which the inconvenience of long-continued absence of rain may be minimized is by the provision of ample storage. The climate of England is by no means dry. There is plenty of water; all that we need, as a great Water Engineer who has now gone to his rest pointed out years ago, is the "barrel" in which to store it. The provision of this very necessary receptacle of course entails considerable outlay on the part of those who are entrusted with the control of water-works, whether as directors of private undertakings or as committees of corporate bodies. But it must be incurred if an efficient service is to be maintained. In the case of water companies, the directors and shareholders readily recognize this; and consequently their extension schemes only encounter opposition, as a general rule, from some fussy public body. When the water undertaking is in the hands of a local authority, however, the case is different. Reluctance to go to the ratepayers for sanction to works which will surely involve an addition to the rates, leads to their postponement—to "muddling along somehow" without them—till some crisis such as a drought arrives, and emphasizes in an unpleasant way the unwisdom of procrastination in a matter of such vital importance to the health of the community. It is folly to blame either directors or committees for imposing restrictions which exceptional meteorological conditions compel them to enforce. Censure should be reserved for those who fail to recognize the necessity for making their undertaking equal to all emergencies, or hesitate to take steps to place it in this position. But while the suppliers of water have to bear the responsibility for obtaining and conserving it, it is no less a duty on the part of the consumers to use it judiciously. Not only in times of scarcity, but at all times, waste should be studiously avoided; and there are many ways in which this may be done, without detriment to health or personal cleanliness. We are so much accustomed to drawing an almost unlimited quantity of water by merely turning a tap, that we have become lavish in the use of it. The recent drought will prove a blessing in disguise if it leads to more systematic efforts to conserve our rainfall when it does come to us, and check waste of water after it has been brought to our doors with so much trouble and expense.

The East London Water Company's Meeting.

The address of Colonel Lockwood, M.P., in moving the adoption of the report of the Directors at the half-yearly meeting of the East London Water Company on Thursday, opened with the satisfactory announcement of an increase of £9685 in the water-rates for the six months ending at Midsummer, as compared with the corresponding half of last year. It must have been all the more gratifying to the proprietors, from the fact that this was the largest advance the Company had had for any similar period. The fixed charges for domestic service have of late been on the increase; the income per house having risen from 23s. 8d. in the first half of 1899 to 25s. 10¾d. in the six months covered by the accounts. The average per house is also higher; having gone up from about 20s., at which it stood for some time, to 23s. As Colonel Lockwood pointed out, these appear to be small differences, but they amount to a great deal in a district like the Company's, where there are no fewer than 213,948 supplies. He thought the accounts might, on the whole, be regarded as satisfactory—as far as they went, for the balance of £29,639 which the Directors proposed to carry over, after payment of a dividend at the rate of 7 per cent. per annum, was not intact, having been materially drawn upon for the purchase of water, which had enabled the Company to maintain a constant supply in their district throughout the whole period of the drought. It was only natural that the Chairman should refer to this fact with some degree of pride; and if its accomplishment has entailed a heavy outlay, the Company have been preserved from the virulent attacks to which they have on previous occasions been subjected. Herein is seen the value of the intercommunication scheme, which would have been in existence long ago but for the opposition of the County Council.

Colonel Lockwood would have been more than human if he had refrained from contrasting the Company's position with that of the water undertakings in Manchester, Huddersfield, Bradford, and other towns affected by the drought. He naturally, knowing something of the difficulties attending the maintenance of a supply of water under such conditions, expressed his sympathy with the districts affected, and doubtless appreciated keenly the period of intense anxiety passed through by the responsible managers of the water-works serving them. Here were instances of much-vaunted municipal water undertakings—held up as examples for the Metropolis to follow—failing to meet the demands upon them. If it is urged that "the forces of Nature," as the Chairman put it, were against the Corporations of these towns, why should not a similar allowance be made, under like conditions, in the case of the Metropolis? But no such fairness would be shown. If, as Colonel Lockwood said, one tithe of the distress caused by want of water in the North had fallen upon London, a certain section of the Press would have teemed with virulent paragraphs, public "indignation" meetings on the subject would have been promptly called, and he and his colleagues held up to scorn in the House of Commons as "guinea-pig Directors, fattening on "their fees, while the labourer in the East-end had no water "to wash in." It is gratifying, however, that journalists are to be found who are ready to give Water Companies credit for good management. A writer in the "Newcastle Daily "Chronicle" on Thursday, referring to the quantity of water in store in that city, remarked that, though it was low, there was little fear of a water famine on Tyneside, as, happily, the water supply had not been municipalized, and the Water Company had been alive to the growing needs of the community that they served. The result had been that during the extremely dry summer they had been "saved by private

"enterprise from the inconvenience and difficulty inseparable from a dearth of the prime necessary of existence."

Colonel Lockwood could not say very much about the measure which the Government have promised to introduce for the creation of a Water Trust to acquire the undertakings of the Metropolitan Water Companies. He has, however, no reason for supposing that it will be inimical to the interests of the shareholders. Why should it be otherwise? It has been proved, in every inquiry to which the Companies have been subjected, that they have, on the whole, discharged their duties creditably; and, this being so, there is no justification for depriving them of their property on any other than fair and equitable terms. If, however, the general public suppose that by the transference of the water undertakings to a Trust they will get their supply of water at a reduced price, Colonel Lockwood believes they will be greatly mistaken. We entirely agree with him. This matter, however, may be left for the future to settle. Meanwhile, the stocks of the Companies are rising in value, as shown by recent quotations in our share list.

ESSAYS AND REVIEWS.

GAS ACTS FOR 1901.

ACCORDING to annual custom, we herewith commence our abstract of the Acts relating to gas supply passed during the last session of Parliament.

The Alfreton Gas Act incorporates a Company originally formed in 1848, and registered as a Joint-Stock Company in 1856. The present capital of the existing Company consisted of £1500, in £5 shares, £5100 of capital stock, and £4200 in £1 shares. The limits of supply are defined, regard being had to the rights of the Riddings District Gas Company. The capital of the statutory Company is £20,800, whereof £10,800 is called original capital, and the balance additional 7 per cent. capital, which may be converted into stock when fully paid-up; with one-third loan. The Directors may, if they think fit, annually appropriate out of the revenue of the Company, and as part of the expenditure on revenue account, any sum not exceeding 1 per cent. on the paid-up capital for the time being, to be called the renewal fund, until the total amounts to 10 per cent. of the paid-up capital and not exceeding £2000. Any contract made by the Company with a corporation or public body is not to disqualify any member of such body for the office of Director; and no Director or shareholder of the Company shall be disqualified for the office of Director of the Company by reason of any contract between him and the Company for any loan of money. Additional gas lands are sanctioned. The sliding-scale is applied, with 4s. 9d. as the initial price. The price to be charged by the Company for gas supplied to the Alfreton Urban District Council for street lighting is to be the lowest price charged for the time being to any private consumer "for illuminating purposes only." Fifteen-candle gas is to be supplied, tested on the works or within 200 yards thereof. Discounts up to 20 per cent. are sanctioned. The Company are entitled to specify the size and material of consumers' pipes and the fittings thereof, which are to be laid in the ground or covered over on the premises, according to stated conditions, and subject to appeal to Petty Sessions.

The Arlesey Gas Act incorporates a new Company for the supply of gas to the parish named, in Bedfordshire, together with the adjacent parishes of Stotfold and Henlow. The capital is £12,000, with one-third borrowing powers. The maximum price of 15-candle gas is 5s. per 1000 cubic feet, tested at the works. The gas lands are scheduled.

The Golborne Gas Act incorporates a Company originally formed in 1867. The share capital of the limited Company consisted of £10,000; and there was no mortgage debt. By the Leigh District Gas Act, 1861, the Company of that name were authorized to supply gas within (among other places) the township of Golborne; and by the Westleigh, Pennington, and Bedford Local Boards (Gas) Act, 1874, the undertaking of the Company was transferred to the Joint Committee constituted under the last-mentioned Act. The powers conferred by these Acts had not been exercised, before the application for the present Act, in any part of the township of Golborne; and the petitioners sought to obtain their repeal. The Act gives the Company a district coterminous with the township of Golborne, Lancashire. The capital is put at £15,000, whereof £10,000 is the original and the balance the additional capital, with one-third loan. Both classes of capital bear a 9 per cent. dividend; but if the additional capital is issued as preference capital, the dividend is to be limited to 5 per cent. The standard price for 15-candle gas is 3s. per 1000 cubic feet. It is enacted that the Corporation of Leigh shall, within three months, take up and clear away all their gas-distributing plant within the Company's district, charging the whole expense to the general district rate of the borough.

The Harpenden District Gas Act incorporates a Company originally formed in 1864, with a share capital of £1500. This capital has been from time to time increased by resolution of the Company to £12,000. There was no mortgage debt. The district of the statutory Company comprises the whole of the parish of Harpenden Urban, and parts of the parishes of Harpenden Rural and Wheathampstead, Hertfordshire. The capital is £32,000, whereof £12,000 is created original capital stock bearing an 8 per cent. dividend; the balance to be issued as 6 per cent. additional shares or stock. The loan capital is to be in proportion of one-fourth. Interim dividends may be declared. The initial price of 14-candle gas is 4s. 9d. per 1000 cubic feet. Pipes may be laid with the consent of the Local Authority for ancillary purposes. Right is given to the District Council to promote an unopposed Bill for the purchase of the undertaking, in the year 1917. In ascertaining the price to be paid for the property, the arbitrator is to first take a sum equivalent to 25 years' purchase of the average of the net yearly profits for the three financial years next preceding the notice to purchase. Interest on borrowed money is not to be deemed part of the working expenses. In addition, the arbitration is to allow compensation for excess plant; and all the Company's costs are to be paid. The term "undertaking" here does not include stock in trade, cash balances, nor the insurance and reserve funds and outstanding debts. The officers and servants of the Company are to be compensated.

The Horley District Gas Act incorporates a Company formed in 1885, who obtained a Provisional Order in 1886. The area of supply is defined. The capital is increased to £67,250, whereof £47,250 is additional capital and the balance capital stock. The borrowing powers are in the proportion of one-third. The initial price of 14-candle gas is 5s. per 1000 cubic feet. The same fittings inspection clause as in the Alfreton Bill is inserted

The Leatherhead Gas Act incorporates a Company formed in 1897 for the acquisition of the Leatherhead Gas-Works, the property of an unlimited Company originally founded in 1850. The capital consisted of £19,380, with a debt of £4800. The area of supply is defined, and the Company incorporated by the name of the Leatherhead Gas and Lighting Company, with a capital of £40,000, and one-fourth loan. The dividend is limited to 5 per cent. The Company may sell or lease superfluous lands. The initial price is 4s. 4d. per 1000 cubic feet, with ¼ per cent. rise and fall of dividend for 1d., although the standard rate is only 5 per cent. Ten per cent. discounts are sanctioned. Gas of 15-candle power is to be supplied, free from sulphuretted hydrogen on a one-minute test. The usual gas-fittings inspection clause is inserted. Demands under £50 are recoverable in the County Court.

The Long Eaton Gas Act incorporates a Company formed in 1864, who obtained an Order in 1880. The share capital then consisted of £16,000 of original capital, and £14,000 of additional capital, with a mortgage debt of £6000. The capital is now increased to £96,600 in 5 per cent. stock, whereof £45,000 is new. Stock unsold by auction can be offered to stockholders, employees, or consumers. The loan capital is in the proportion of one-third. For the purposes of the insurance fund, the existing paid-up capital is taken at £30,000. Pipes may be laid for ancillary purposes. The initial price of 15-candle gas is 5s. 2d. per 1000 cubic feet within the township of Long Eaton, and 6s. 2d. beyond. The initial price for calculating the dividend on the new capital raised since the passing of the Act is 4s. and 5s. respectively. Accounts not paid within one month may be surcharged after the rate of 1d. per 1s. on the price of gas. The fittings inspection clause is inserted. A purchase Bill, promoted by the District Council in the next session of Parliament, is not to be opposed by the Company, except on clauses. In the event of arbitration, 10 per cent. is to be allowed for compulsory purchase; also the expenses of the present Act. Officers are to be compensated. Meanwhile, the Company are not to issue any new capital, and may only borrow up to £7000.

The Omagh Gas Act incorporates a Company formed in 1850. In 1879 the capital was £5000; and since then the nominal amount has not been increased. But the profits of the undertaking, after paying 5 per cent. dividends, have been spent upon the works, which are now worth £12,000. The capital stands at £27,000, whereof £12,000 is original capital, all bearing 5 per cent. dividend. The loan capital is in the proportion of one-third. The initial price for 15-candle gas is 4s. 6d. per 1000 cubic feet. The Omagh District Council may promote a purchase Bill in one of the next three sessions of Parliament.

The Otley Gas Act incorporates a Company dating from 1866, with a Provisional Order of 1889. The share capital was then fixed at £20,000 original and £4600 additional capital. The sum of £3051 has been received as premiums; and there is a mortgage debt of £6875. The capital is to be converted into 5 per cent. stock, increased by £16,000. The loan capital is in the proportion of one-fourth. The standard price of gas is 3s. 6d. per 1000 cubic feet, and the quality 15 candles. The District Council may purchase within four years, on the usual terms for compulsory expropriation. The price chargeable for gas to the public lamps is to be 6d. per 1000 cubic feet less than that charged to any private consumer. A special discount of 5 per cent. is to be allowed on all gas consumed in the Council offices.

The Swanage Gas and Water Act incorporates a Company formed to take over the gas undertaking established in 1880 by the late Mr. Burt. By a Provisional Order of 1883, the capital of the undertaking was declared to be £15,600, with a loan of £3900. The Burt Trustees constitute the Company, which has a gas capital of £35,600. New issues must be sold in the usual way. The proportion of the mortgage debt is increased to one-third. The maximum price of gas is 5s. 6d. per 1000 cubic feet; and the illuminating power 14 candles.

CHEMICAL INSTRUCTION AND THE CHEMICAL INDUSTRIES IN GERMANY.

HAVING dealt in a former article* with the growth and character of the instruction in chemical science and practice to be obtained in the various educational institutions in Germany, we will glance at some of the particulars given in the Foreign Office report, drawn up by Dr. Rose, as to the progress of the German chemical industries, which have advanced proportionately with discoveries made in chemical science, and with the increased facilities for chemical instruction. "The annals of industrial progress show few examples of such an intimate relationship between pure and applied science."

Germany is not better adapted, says Dr. Rose, than other countries for the foundation of great chemical industries, except, perhaps, that she is richly endowed with springs and rivers, which are indispensable for chemical processes, and possesses considerable mineral wealth, together with great stores of salt and similar compounds. Several hundred years ago, when the mineral resources of other lands were scarcely investigated, Germany was known for its various mines and their products. The first beginnings of a purely empirical chemical industry are to be traced back to these times, with their various chemical products, such as copper and iron, vitriol, metal, ash, salts of cobalt, and arsenic—one of the reasons probably why in the Middle Ages Germany was the resort of alchemists from many countries.

The progress of the chemical industries in Germany—which had their beginning in the laboratories of the apothecaries who came into being some 250 years ago—was at first very slow; the competition of British acid, soda, and other works being keenly felt. Aided by the possession of cheap raw materials and cheap transport, this country was for long able to undersell German chemical products in their own markets. In fact, the development of all industries in Germany during the first half of the Nineteenth Century was slow compared with that witnessed in Great Britain, France, and the United States; but the ground so lost was recovered with great rapidity during the past fifty years. The surprising development of the German chemical industries that took place in that period may be said to have begun when Liebig opened his public chemical laboratory, and commenced in Germany the systematic education of young chemists.

At first, the research work was principally devoted to minerals and inorganic substances. But in 1838 came the first organic synthesis by Wöhler (the pioneer of the uninterrupted series of triumphs achieved by Germany in organic chemistry), then the discoveries of Runge, Hofmann, and Perkin in aniline dyes, and, finally, in 1865, the famous benzol ring theory of Kekulé. From this time, says Dr. Rose, the German chemical industries have advanced irresistibly, in spite of many grave inner crises, until they have obtained at the present day the foremost place in the world. The work of completion and expansion, we are told, still continues. The chemical works are losing their old character of laboratories on a large scale—the apparatus and plant being no longer constructed according to the customary laboratory pattern of flasks, retorts, and evaporation dishes, but are adapted to the immediate needs of raw materials and of new processes of manufacture. New means and facilities are everywhere employed in the most liberal manner—high pressure, compressed air, steam, vacuum, and electrical energy. In all directions the old unscientific and uneconomical method of firing with solid fuel is being abandoned in favour of gas fuel; and the question of the complete utilization and regeneration of heat has become of the greatest importance.

This indefatigability in research and wise readiness to adopt all improvements in methods and machinery, combined with the constant addition of highly trained recruits to the ranks of the army of chemists, have had results which may be best summarized by stating that the total annual production of the various chemical industries in Germany is now of a value of about £50,000,000, and that imports have in many cases fallen off while exports have increased enormously. The report of Dr. Rose gives a great many interesting statistics demonstrating the growth of the individual industries, from which the following particulars are noted.

The use of salts for artificial manures was primarily due to the teachings of Dr. Liebig, who, in his classical investigations upon the application of chemistry to agriculture and to physiology, asserted and proved that if soils were not to become impoverished, those salts of which they are deprived by agriculture must be restored to them in the form of manure. He demonstrated, for instance, that an acre of potatoes required about 90 lbs., and an acre of beetroot about 150 lbs., of potassium salts; and that, further, the usual manures—wood-ash, beet, and wool refuse—were themselves derived from the soil. These considerations were instrumental in leading to the discovery and working of the Prussian salts mines at Stassfurt, and of the Anhalt salt strata, the output from which was valued at £800,000 in 1890, and is now about twice that figure.

It is not possible to put into statistics the immense benefit conferred upon agriculture by this practical application of chemical science; but it is certain that, without the experience derived from the putting of Liebig's theories into practice, it would scarcely have been possible to obtain such successful results for so many years as have been obtained with the cultivation of beetroot for the manufacture of sugar. The fact that the percentage of sugar yielded by the beetroot treated has steadily increased from 5·72 in 1840, 8·17 in 1860, 8·93 in 1880, to 13 in 1899 is of great significance as showing the commercial value of improved chemical methods. Had the methods of 1840 prevailed in 1899, and the same quantity of beetroot been treated as was treated in the latter year, the yield of sugar would have been some 900,000 tons less—representing a sum of (say) £10,000,000 to the manufacturers.

Liebig was the first to show, in 1840, that nitrogen compounds were necessary for the growth of plants. His experiments—confirmed by Lawes, Gilbert, and Pugh in England—proved that the necessary nitrogen must come, not from the air, but from nitrates and salts of ammonia in the soil, and that the presence of the latter also materially assisted the disintegration of the phosphates. As soon as these facts were recognized, the salts of ammonia began to rise in value; and the demand for saltpetre for manuring purposes far exceeded the demand for it for the manufacture of gunpowder. At first, ammonia was procured from animal refuse, but soon after it was obtained in constantly increasing quantities as a bye-product of the distillation of coal.

In 1872, Germany produced 5000 tons out of a total European output of 42,000 tons of sulphate of ammonia; in 1897, Germany's production amounted to 16,000 tons at gas-works, and 74,000 tons at coke ovens. The latter figure "could perhaps be trebled if all the ammonia which is allowed to escape into the air during the formation of coke were utilized," says Dr. Rose; but the complete utilization of all the bye-products of coke-ovens and blast-furnaces (which is, rightly, the dream of manufacturers and chemists alike) may possibly—we think most probably—be found to be not commercially practicable. In other words, it may be found that the game is not worth the candle. In spite of the enormous output of 90,000 tons in 1897, the home supply of sulphate of ammonia was not equal to the demand. Ammonia is needed not only for agricultural purposes, but also, latterly, for the manufacture of soda, aniline dyes, and ice, and for cleaning wool. A further 26,000 tons were, therefore, imported during that year. Germany also imports large quantities of Chile saltpetre annually. It may not be without interest to give the total quantities of artificial manures required by Germany each year:

	Tons.	
Superphosphates	500,000	Value, about £5,000,000.
Slag phosphates	400,000	
Ground bone guano	70,000	
Precipitated phosphates	5,000	
Chile saltpetre	350,000	
Sulphate of ammonia	90,000	
Potassium salts	600,000	
Total	2,015,000	

Following close upon the application of chemical science to agriculture, comes the discovery of the aniline and other dyes. Aniline was discovered by Runge at Berlin in 1835; and six years later Hofmann discovered benzol in coal tar. Mitscherlich had discovered nitro-benzol in 1835; and Zinin showed, in 1841, that it could be converted into aniline by reducing agents. Mansfield, working in Hofmann's laboratory, devised a process for the production of benzol from coal tar on a large scale, and by this means rendered the production of great quantities of aniline by way of benzol and nitro-benzol possible, as aniline itself only occurs in coal tar in very small quantities. These chemists may, says Dr. Rose, be considered to have laid the foundation of the German aniline dye industry.

The various artificial dyes, of which the discovery then began, joined without displacing the ranks of natural dyes until, in 1868, Graebe and Liebermann dealt the deathblow to dyes prepared from the madder-root, by their discovery of the preparation of the artificial alizarine colours from the anthracine contained in coal tar. This discovery absolutely killed the industry of madder-root cultivation; the production of that root in France falling from 25,000 tons in 1870 to 500 tons in 1878. The red colour used for the uniforms of the French infantry is now almost exclusively "Made in Germany!"

What these practical applications of science have done for the prosperity of the German nation may be gathered from the fact that, in spite of the very heavy fall in prices, the estimated annual value of the dye industry has risen from £1,200,000 in 1870 to £3,250,000 in 1890, and to £6,000,000 in 1898. The Baden Aniline and Soda Works (with a capital of £990,000) paid not less than 24 per cent., the Höchst Colour Works (£850,000) not less than 26 per cent., and the Elberfeld Colour Works (£600,000) 18 per cent. in each of the five years 1895-9. The discovery of a practical process of preparing artificial indigo—the result of the work of a great number of years by many German chemists—must also be mentioned. The military authorities are now making experiments with artificial indigo for the dark-blue uniforms of the German army. Should these prove successful, another blow will have been dealt to the already declining Indian indigo industry. The Bavarian Government have decided in favour of the artificial dye, the patents for the production of which are in the hands of the Baden Aniline Dye Works, which employ more than 6000 workmen and over 100 academically-trained chemists. The process used is that of Heumann's synthesis, which starts from ortho-amidobenzoic acid as raw material. This substance was formerly too costly to enable indigo thus prepared to compete successfully with natural indigo. The above works have, however, succeeded in oxidizing naphthalene to phthalic acid by means of fuming

* *Ante*, *p.* 833.

sulphuric acid in the presence of sulphate of mercury, and so to prepare the ortho-amidobenzoic acid by way of phthalimide.

Indigo is also manufactured synthetically at the Höchst Colour Works by the Beyer-Drewsen patents, for the synthesis of methyl indigos; but this process is at present more costly, and, even if it became cheaper, there is scarcely enough toluol available to enable sufficiently large quantities of indigo to be manufactured by the process. The synthesis of indigo by naphthalene-ortho-amidobenzoic acid will, therefore, most probably prevail, as large quantities of naphthalene can be procured at £4 10s. per ton.

PARIS EXHIBITION REPORTS AND LESSONS.

THE last issue of the "Chamber of Commerce Journal" contains a supplement giving summaries of various special reports on British exhibits at last year's Paris Exhibition, written for the London Chamber of Commerce, of which it is the official organ. Mention is also made of the recent publication of two volumes containing an account in detail of the doings and deliberations of the Royal Commissioners who were appointed, in 1898, in connection with the representation of Great Britain at that Exhibition. Much of the information given therein does not call for any comment in the "JOURNAL;" but some of the general observations made may prove of interest to many manufacturers connected with the gas industry, whose exhibits, however, were chiefly conspicuous by their absence. It may here be noted that a special report dealing with the Gas Section of the Exhibition was written for the London Chamber of Commerce by Mr. C. E. Brackenbury, Assoc.M.Inst.C.E.; and it finds mention in the supplement referred to. "This report," it says, "is brief but suggestive. The gas exhibits of the Paris Exhibition showed that British supremacy is gradually slipping away from us; and the author calls attention to the absence of English firms noted for their machines and appliances used in the production of gas. In other cases English firms who have exhibited have not done so on a sufficiently large scale, and suffered by comparison with the exhibits of other countries. Although well-known British firms exhibited gas-engines, their representation was inadequate." These remarks with reference to the British Gas Section are really applicable to the whole Exhibition, as will be seen from the following quotation from the Royal Commissioners' observations:—

> Taken as a whole, it cannot be said that the British Industrial Section presented a fair reflection of the industry of the country seen at its best. With some notable exceptions, comparatively few of the highest class of British manufacturers took part in the Exhibition. Many of them, when approached, pleaded that if they exhibited at all they would have to do so on a scale which would put them to great trouble and expense, while they had no inducement to seek to extend their connections, since their businesses are so large that they can hardly execute their orders.

We need hardly stop to point out the ruinous conservatism of such reasoning. A business that is not "extending its connections," and, however "large," is not yearly becoming larger, is falling back in the commercial race, and is being outstripped by more eager firms, whose intention it is continually to extend and grow greater. No business can be stationary; for if it does not progress, its relative position is altered by the advance of others. It is with the business unit as with the collection of units into a nation. Both must be Imperial. There can in no case, with either honour or success, be any resting upon past achievements, any contentment with present attainments. There must always be striving after sounder knowledge, and seeking for wider developments both in business and in empire, if fortune is to be won and maintained. But to return to the report. It goes on to say:

> The result [of this lack of enterprise] was that some industries were represented by firms of minor importance. Their displays were often creditable, but they could not be taken as representing the best productions of the country, nor did their exhibits compare as favourably as could be desired with those of other countries. This is partly owing to the somewhat different view of exhibitions taken by Your Majesty's Government and the Governments of other countries. The latter appear to regard them as a valuable means of promoting their commercial interests. They spend large sums of money, and assist and encourage their manufacturers in such a way that they are able to select the best examples in every department of industry, and to present them in the most attractive form. We, on the other hand, have to rely exclusively on the voluntary efforts of our manufacturers, and our exhibitors have to bear the whole of the expenses which participation in an exhibition involves. We are inclined to doubt whether British industry as a whole derives any benefit from exhibitions in which British exhibitors enter at such a manifest disadvantage. Our system has remained unchanged for half a century; but the conditions are no longer the same. When exhibitions had the charm of novelty, the great manufacturers took a pride in showing their best productions to the world. There was comparatively little competition; and they had nothing to fear from the rivalry of foreign countries. Now exhibitions have become so common that manufacturers no longer take the same interest in them, and only exhibit if they see a distinct prospect of advantage to be gained by doing so. At the same time, foreign industries have made gigantic strides, and in many branches of manufacture have become formidable rivals to our own in the markets of the world. The industrial interests of the country, as a whole, gain nothing from an exhibition unless they are represented upon equal terms with foreign industries. There is no apparent advantage in showing inferior British productions side by side with the best productions of foreign countries. Yet this is, to a large extent, the effect of the system which has hitherto prevailed. We are of opinion that the voluntary system can no longer be relied upon to secure an adequate representation of British industry, and that in any future International Exhibition in which it may be decided to take part, it will be necessary to have recourse to the principle of selection which has been largely adopted by Foreign Powers. This principle, which involves the payment of some of the expenses hitherto borne by exhibitors, would necessitate larger grants than it has been customary to give; but we think that unless some approximation can be made to the expenditure of Foreign Powers, no good purpose would be served by entering into further competition with them.

This rather long quotation seems to us to present the actual situation in a very fair and sound way. Its concluding sentence, however, appears to hint, in a half-hearted way, at there being some possibility of a future withdrawal on the part of England from the friendly rivalry and competition of International Exhibitions. It is sincerely to be hoped that such an exclusive policy will never be followed, which we are convinced would prove the very reverse of beneficial to English manufacturers.

The Commissioners' report then goes on to compare the general arrangement of the British Section with that of other countries. The latter were symmetrical in design, with uniformly decorated show-cases. On the other hand—

> In the British Section, every exhibitor used his space in accordance with his own fancy, and showed what he pleased. He provided his own show-case, and, within the limits of his space, was free to indulge his own taste, subject only to the regulations of height and other conditions imposed by the regulations. The result was anything but happy; and the contrast between the orderly, symmetrical appearance of the foreign spaces in certain groups with the undignified collection of show-cases of different sizes and design which filled the British space, was little less than painful. The cause of this conspicuous defect is twofold. It arises, first, from the difference of system, to which allusion has just been made; and, secondly, from the extreme unwillingness of British exhibitors to enter into any form of combination, or to submit to any restriction of their independence. As a rule, a British manufacturer will only exhibit if he can select his own goods, and display them in his own way and in his own show-case. He is impatient of advice; he will not submit to dictation; he will not share a show case with others; nor will he join with others to adopt a uniform plan of arrangement. In many instances, he regards his exhibit as of much more importance as an advertisement, and a competition with rivals at home, than as a comparison of his productions with those of other countries.

With this very true observation, and correct, if a little unpleasant, description of some of our characteristics, we will leave this report to the consideration of our manufacturers and business men. Their serious study of it, and their honest application of it to themselves, will bring not only profit to them individually, but also advantage to the community at large.

THE NEW MICHAEL AND WILL.*

IT was full time for another edition, brought up to date, of the famous text-book on the English law of gas and water. The previous edition bears the date 1894, and included the beginnings of the law of electric lighting. The latter subject has since outgrown the limits of space which could be allotted to it in this work, and accordingly the same author has published a separate book upon it, which is now in its second edition. In concentrating his present book upon the law of gas and water, Mr. J. Shiress Will has not only found ample matter for a large volume, but has treated it in a manner that must be allowed to be a great improvement on the style of former editions. To say that "the work generally has been thoroughly revised, and in parts re-written," is only to claim that the author has recognized the obligations that attach to the office of everyone who undertakes to teach a living and growing study. No writer of a book pretending to be an authority on a progressive subject treats his public fairly unless he keeps his matter up to date.

One great improvement introduced by the author must be mentioned at once. "Throughout the work the year of each decision has been given in accordance with the latest usage;" and an excellent fashion it is. In addition to the traditional cabalistic shorthand in which the statutes were formerly indexed, we now have the short title and the date of the Act, which is a great help to a layman. The same sensible treatment has been applied to the cases cited; so that for the first time it is possible to tell at sight how these decisions stand to one another in date. The interest of inquirers into the subject will be most powerfully engaged, however, by the statement that the "Introduction" has been considerably expanded, and now includes, among other new matter, a digest of the precedents relating to the compulsory acquisition by local authorities of the undertakings of gas and water companies during the last twenty years. The main data of these transactions are given in classified appendices. We will proceed to deal with the matter of this Introduction at once, with particular attention to what is new in it.

It is provided, to begin with, with a very useful synopsis, which tells the student at a glance what it is all about. After the usual preliminary glance at the extent of the statutory gas industry, the author proceeds to recount how parliamentary authority for the supply of gas is obtained, and what consequences follow thereon.

* "Michael and Will on the Law Relating to Gas and Water." Fifth Edition. By John Shiress Will, K.C. London: Butterworth and Co.; 1901.

We never have regarded the treatment of this point—the expediency of gas companies acquiring statutory powers—as adequate, in "Michael and Will;" and we retain this opinion still. Because, after all that he promises on the score of re-writing and extending his Introduction, Mr. Will is content to reprint the old opening paragraphs without a word altered. He says, for instance, that parliamentary authority for the supply of gas is obtainable either by Special Act or by Provisional Order, but leaves it to be inferred that the selection of one means rather than the other is a matter of perfect indifference. Those who have the advising of gas companies on such matters, know, on the contrary, that the choice of procedure is the first thing to be settled. Is it, or is it not the law, that if a company want to acquire land compulsorily, the only proper procedure is by Bill? Mr. Will merely says "a company" may apply for either (Act or Provisional Order) at their discretion. True; but the choice depends upon the nature of their wants. If one reads on through the Introduction, one learns that the compulsory taking of land cannot be done by Provisional Order; but this might have been stated when the alternative procedures were first mentioned.

Then there is a mischievous old paragraph on the second page of the Introduction, which ought to have been deleted or modified. It is the statement that "companies authorized by Parliament acquire, by implication, a regulated monopoly, because, so long as they do their duty within the limits assigned to them, Parliament will not authorize any other company or any local authority to compete with them." Monopoly of what? Not of artificial lighting, because there are the Electric Lighting Acts. Not of the sale of combustible gas, because there is the South Staffordshire Mond Gas Act. The less one talks, after this, of the monopoly of a gas company, the better. The author has strengthened the paragraph, on the second page of the Introduction, wherein he states that urban authorities are empowered, with the mere sanction of the Local Government Board, to buy any existing gas undertaking, by laying it down that companies, whether statutory or otherwise, are equally empowered by the Public Health Act, 1875, to sell their property to local authorities. Why then are Purchase Acts needed? The statement as it stands appears rather bald. Again, it is explained further on. It would have made for clearness if these parts of the Introduction had been entirely re-written, with the object of bringing such considerations closer together. Thus, though the Introduction begins without explaining why it is advisable for gas companies to obtain statutory powers, if one reads to the end of the fourth page, one stumbles upon a cursory reference to "the inconveniences to which companies not possessing the authority of Parliament are subjected to (*sic*) when attempting to break up the public streets," and so on.

Speaking of the Gas-Works' Clauses Act, 1847, the author does not mention the somewhat important consideration that this enactment applied to an era when competition in gas supply was common. By the time the Gas-Works' Clauses Act, 1871, was drafted, this condition of affairs had passed away; and as compensation for the peculiar privileges then enjoyed by statutory gas companies, they were placed under the obligation to supply all intending consumers on demand. Then came the inventions of the sliding-scale and the auction clauses. Mr. Will does not mention the asserted defect of the latter requirement, which was corrected in the South Metropolitan Act of the present year. As regards the moot question of the integrity of the standard price, the author, while recognizing the refusal of Parliament to alter this "pivot of the sliding-scale," as he rightly calls it, merely notes, without remark, the reduction of the initial price made in the Lea Bridge case, in 1899.

The important precedents as to limitation of the amount of the "carry-forward," set in the West Ham and Crystal Palace District Acts are duly noticed. The subject of compulsory purchase of gas undertakings by local authorities is very well and clearly treated. We wish, however, that the author had said more about the consequential features of these transfers, especially as to the moral obligation that rests upon the vendors to safeguard the interest of their officers and old servants. No mention appears of the precedents for the inspection of consumers' fittings.

In dealing with Metropolitan gas affairs, the author, for the first time, inserts the extant provisions of the City of London Gas Act, under which the London Gas Referees are appointed. He reproduces the much-discussed requirement that one at least of the Referees shall have "practical knowledge and experience in the manufacture and supply of gas." The statutory history of the London Gas Companies is narrated succinctly and intelligibly, including the proceedings of Sir James Rankin's Committee. The latest notification of the Gas Referees is given in full; and so is the Model Gas Bill, as amended in 1900.

There is, of course, nothing to criticize in the purely law portions of the book. The numerous cases appear to be well posted to date; and the index is unexceptionable. Those who consult the book will find much help in the clear and explicit narrations of the facts of ruling cases, and the careful way in which the essential points of the rules are distinguished. It is, obviously, impossible that we should test every instance of the kind; but we selected at random the subject of "nuisance," and found nearly a whole page of the index taken up with various references under this heading. The first note to clause 29 of the Act of 1847 relates to the Sutton, Southcoates, and Drypool Company's case (1899); and it is pointed out that this case shows that a nuisance may arise from the construction of works as well as from the process of manufacturing gas, and also that the sections referred to include private nuisance as well as public nuisance. This is precisely the kind of legal help a layman requires.

The question of a gas company's liability for damage done by escapes of gas from mains and services is also illustrated by decisions, which leave one under the impression that the trouble from electrolysis is likely to weigh even more heavily upon gas manufacturers than is commonly supposed. Hitherto the Courts have been very hard upon gas companies in cases of escape of gas, as may be seen in the instance of *Price v. South Metropolitan Gas Company* (1895). Here it was held that the Company ought to have kept such a watch over their mains that they ought to have discovered that the Local Authority had been excavating the subsoil within a few inches of the pipe, leaving it without proper support. If this judgment can be made to cover the analogous risks of electric tramway working, it will follow that the gas company must keep a sharp look-out for main injuries, unless they wish to pay for injuries originating in the actions of other parties.

It is unnecessary to comment on the notice taken by the author of rating questions. Suffice it to say that references are given to all the decisions connected with the rating of gas-works. The portions of the book relating to water are not discussable, being occupied with dry law.

ELECTRIC LIGHTING MEMORANDA.

A Grave Situation—The Way of Relief—No Excuse for Torpidity—Why Some Cases are Hopeless.

It is a good many years since we instituted this column of observations upon the current aspects of those electrical industries, more especially electric lighting, in which the followers of the gas industry are interested as trade rivals. It has been our professed motive, in publishing these notes, to exhibit the "seamy side" of the subject, which is not turned to the public gaze in any other periodical. While all the newspaper press, and most scientific journals, have agreed to puff electric lighting, here the cold facts of the matter have been displayed, without malice as without favour. We withstood the Brush mania at its height; predicted, and in due time recorded, the downfall of all the early electric light companies; and have exposed the craze of municipal electric lighting, which has saddled so many local government areas with additional burdens where they expected financial assistance. All this, from our selected point of view, has been quite the right and proper thing to do; but the time has arrived when it becomes incumbent upon us to ask ourselves and our readers how the case stands. We cannot tell, of course, whither these words of warning criticism have penetrated, nor whose money they may have helped to divert from a losing venture. The fact remains that, although there are no fresh electric lighting companies of the old pattern started, those that are actually in the business hang on; and the disappointment of local authorities who have electric lighting undertakings does not prevent others following in their tracks. A new one was started in Battersea only last week.

Far as it yet is from overtaking the annual increase of the gas industry, electric lighting holds on, and ever grows. This circumstance weighs more with the investing class of the community than those who keep their gaze fixed upon gas property are able to realize. The stoppage of the growth of one or two leading gas undertakings, although referable officially to the weather and all sorts of collateral circumstances, has been understood by outsiders as an indication that gas has seen its best days. Of course, we know that this judgment is mistaken; but the serious matter for gas people is that it should exist in any quarter. The story goes that a man who had a considerable sum of money to invest recently was minded to put it into gas, but was dissuaded by his broker, who advised a good railway stock instead, on the ground that gas is bound to go down in the long run before electric light. This is a grave situation, which no light-hearted optimism in gas company board rooms is competent to relieve. What is wanted, without question and without a moment's unnecessary delay, is a general rising to the occasion, on the part of gas officialdom. The way was indicated last week by the Chairman of the Commercial Gas Company, who was able to claim that a serious check had been put upon the development of the public electric lighting in the Company's district, by the adoption on their part of the system of incandescent lamp installation and maintenance, at cost price. This is the only way, at present, to carry the war into the enemy's country. It is fatal for gas companies to sit still and wait for custom. If gas directors and officials cannot come out of their shell and push trade, their fate will all too soon overtake them.

Experience proves, in many instances, that where gas companies go in heartily for incandescent burner maintenance, at cost price, electric lighting cannot make headway. Consequently, if it is prevented from growing, its premature decease is brought well within the bounds of possibility. That is the result which every right-spirited gas official should keep in view as his end and aim in this connection. Let but a single electric lighting company be killed by energetic gas competition, and the gloomy finance that threatens some big gas undertakings will be brightened up, as by magic. Too much good-humoured toleration of trade rivals has characterized leading gas companies in the past. Some of these have now learnt how annoying even a slight check to their accustomed expansion may be; and they ought to be

thinking how best they can take their coats off to make trade again. The recipe is that found by the Commercial Company, after its value had been proved by Sheffield, the South Metropolitan Company, and many others. Only a gas undertaking can do the needful work, because nobody else has the necessary interest. Some gas officials talk in public and private about the cost and fragility of incandescent mantles, and querulously inquire when the first will be reduced, and the latter corrected. Such questions are only a cloak for indolence and neglect of duty. If incandescent mantles were on sale at a penny apiece, these grumblers would still have something to complain of them. As to the fragility, this is nothing in the hands of a person familiar with the fixing of the mantle; and they can never be made strong enough to endure the tender mercies of the average domestic servant. Let gas companies bestir themselves, and do the best they can with the means already at hand; and improvements will come in the natural order.

This, then, is the "moral" of the present story. Gas investments are not held in the estimation they should command, primarily because electric lighting has made inroads upon the preserves of some big undertakings. On the other hand, gas has not yet in a single instance definitely stopped the career of an electric lighting undertaking. The latter continue to grow; and although their capital grows also, and their state is not usually prosperous, still they often appear to hurt gas if they do not benefit themselves. That is how the ordinary investor sees it. He would not put any money into electric lighting; but neither will he entrust it to gas directors as a matter of course. It is for the gas interest to drop their reserve, and act like any sensible shopkeeper threatened with new competition. If his shopmen are not up to the mark, he gets younger and smarter ones in their stead. Let gas directors stop blaming the weather for their bad returns, and work incandescent lighting for all it is worth. Then we might see something of what gas is capable of doing on a competitive basis. It is to be feared, however, that some boards which most need reform are past it, through age and personal preoccupations.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 928.)

BUSINESS in the leading departments of the Stock Exchange last week was very poor. The public seemed listless and disinclined to go in for anything. This frame of mind was largely induced by impatience at the protraction of the war, and was aided by circumstances in one or two special markets. However, there was not any considerable drop in prices, and not much harm was done. The Exchange was closed on Saturday; and this lent additional help towards keeping things quiet. The Money Market ruled pretty steady until the end of the week, when pronounced ease set in, owing to a superabundance much in excess of all possible demands. From the rather depressed general departments, it is pleasing to turn to the Gas and Water Market, and to record a continuation of the remarkable buoyancy which has recently been in progress. This feature is more especially remarkable in the case of Water Stocks, which rise by leaps and bounds. Some of the advances are more fully noted below. In Gas securities, there was no lack of business, though it was to a great extent transacted in the issues of one undertaking. Gaslight ordinary was very brisk, and on Tuesday it changed hands more than once at 100¼—the highest point. But from this price it began to recede; and on Friday it was done once at 98¼—the lowest of the week. The closing quotation was thus the same as the opening. A few operations in the secured issues were marked at fair figures. South Metropolitan was moderately dealt in; but it could not beat middle prices. In Commercials, nothing at all was done. Business in the Suburban and Provincial group was decidedly restricted, but some interesting advances were recorded. Tottenhams made a good stride upward; and Brighton and West Ham rose. In the local market, Bristol shows a gain of a couple of points. The Continental Companies were not active; but they showed strength, especially Imperial, which advanced its figures. Among the remoter undertakings, there was no feature calling for remark. In Water Stocks, although no unusual number of transactions were recorded, there was a wonderful advance in prices—extending to every Company in the list. It may be noted that, in the last two weeks, the £100 stock of the Lambeth Company has risen 22, and that of the West Middlesex Company 20½; while other undertakings have had advances falling only a little short of these figures. One curious result of these rises is that Southwark ordinary is figuring at a dearer price than the choicest debenture stock in the list. But here perhaps there is a forecasting of coming events.

The daily operations were: Moderate business in Gas on Monday. Both Brightons rose 2, and Imperial debenture and Gaslight ordinary 1. In Water, Southwark gained 2, ditto "D" 7, and West Middlesex 1. On Tuesday, Gaslight ordinary was very active. Tottenham "B" rose 2, Imperial 1, West Ham 7 per cent. ½, ditto debenture 2. In Water, West Middlesex moved up 9, Kent and Lambeth 2½, Chelsea and East London 2, and Grand Junction, Lambeth 7½ per cent., and both Southwarks 1. Wednesday was fairly active. West Ham debenture rose 2; but Gaslight ordinary receded 1. In Water, New River rose 3, Lambeth and Southwark 2, Chelsea, Grand Junction, and West Middlesex 1. On Thursday, nothing in Gas moved, but in Water, Southwark gained 5, ditto "D" 3, New River 2½, and Chelsea, Lambeth 7½ per cent., and West Middlesex 2. Friday was a rather quiet day. Tottenham "A" rose 5, and ditto "B" 3. In Water, Chelsea moved up 3, West Middlesex 2½, Lambeth debenture 2, and Southwark 1. The Exchange was closed on Saturday.

PERSONAL.

Mr. H. E. JONES, M.Inst.C.E., Engineer of the Commercial Gas Company, has been elected a Director of the European Gas Company, Limited, in place of the late Mr. E. T. E. Besley, K.C.

At the meeting of the West Bromwich Corporation last Wednesday, Mr. HAROLD E. COPP was appointed Gas Engineer, in succession to Mr. T. Glover. Mr. A. O. JONES is to be Mr. Copp's Assistant.

Mr. DAVID IRVINE has been appointed Manager of the Kirkcudbright Corporation Gas-Works, in succession to his brother, Mr. John F. Irvine, who died recently, after having held the post for only a few months.

Mr. ALLEYNE BROWN, a member of the firm of Messrs. Brown, Brown, and Murphy, solicitors, of Southport, has been appointed Clerk to the newly-formed Joint Water Board for Southport, Birkdale, and West Lancashire.

Mr. J. W. SWAN, President of the Senate of University College, London, and a Past-President of the Society of Chemical Industry, whose name is well known in connection with his incandescent electric lamp, has been presented with the honorary degree of Doctor of Science of the University of Durham.

Mr. J. WILKINSON, F.C.S., the Engineer and Secretary to the Drighlington and Gildersome Gas Company, has been appointed Superintendent of the Grimesthorpe works of the Sheffield Gas Company, in succession to Mr. A. J. Hope, who has succeeded Mr. Allan at Nelson.

On the occasion of his marriage, Mr. JOSEPH SPEAKMAN, the Secretary of the Gas and Electric Lighting Department of the Longton Corporation, has received a tangible token of the esteem in which he is held by the Manager and employees. Their gift to him took the form of a handsome marble clock and a pair of bronzes.

The death of Mr. John Chadwick having necessitated some change in connection with the management of the Oldham Gas-Works, Mr. ARTHUR ANDREW has been promoted to the position of General Manager, with an increase of £100 per annum in his salary. He has been 35 years in the service of the Corporation. It is intended to appoint a Works Manager under Mr. Andrew.

Subject to his own consent, Alderman MILES may be looked upon as the prospective Mayor of Bolton. Some little irritation has been caused in the ranks of the Liberal party, owing to the Alderman having been named for the civic chair at a private meeting of the Consultative Committee of the Conservative party; and although it is protested that the meeting was purely preliminary in view of the Council meeting at which the matter was to be considered, the Liberal party are of opinion that the whole Council should have been taken into consultation. While Alderman Miles is spoken of in the highest terms of praise on both sides of the chamber, it is stated that, in view of the action of the Conservative party, the Liberals will abstain from participation in the usual non-party deputation to the Mayor-elect. But his election is not likely to be opposed on Nov. 9. Alderman Miles has made many friends in the gas industry; and we feel sure they will share with us the hope that this little cloud will pass away, and that his year of office will be bright and free from care. As Chairman of the Gas Committee he worked hard for Bolton, and deserves well of his fellow-townsmen.

The Past-Presidents and the Committee of the Eastern Counties Association availed themselves of the autumn meeting to give a complimentary dinner to their colleague Mr. John Young, who, as most of our readers are aware, is about to leave Norwich for the more responsible position under the British Gaslight Company at Hull. During the time that Mr. Young has been in the Eastern Counties he has, by his innate affability and amity, endeared himself to his professional brethren in the district; and so far as time would permit him, he has borne a good part in forwarding the work of the Association. Although the distance will prevent him continuing any intimate relationship with the Association, it is hoped that it will not be altogether severed. The dinner was given at the Lion Hotel, Cambridge, on Wednesday evening; and the table was laid for about sixteen. Mr. J. G. Hawkins, of Spalding, presided; and his connection with the early days of Mr. Young in the gas industry made his chairmanship on this occasion most appropriate. The proposing by him of the principal toast of the evening—"Our Guest"—brought to light the fact that when Mr. Hawkins was in charge of the Sheffield Gas Company's works in the early seventies, "young" John was then at the Neepsend Works, laying the foundation of the professional career which has been so eminently successful. With the many good wishes expressed on Wednesday night for the continuance of that success, we heartily unite ourselves. The happy thought and good feeling which prompted this parting gathering was much appreciated by Mr. Young.

NOTES.

Origin of the Word "Gas."

In an interesting book published by Sir M. Foster, dealing with the history of physiology during the sixteenth and two following centuries, mention is made of the work of van Helmont (1577-1644), the originator of the term *gas*. It appears that van Helmont united exact chemical physical knowledge with marked spiritualistic views. These two sides of his character are indicated by the two words *gas* and *blas*, "two new terms," he himself says, "introduced by me because a knowledge of them—that is, of the things they signify—was hidden from the ancients." By blas, van Helmont meant an invisible spiritual agency which directs and governs material changes; this is the *archeus* of Paracelsus. By gas he clearly meant what we now call carbonic acid gas. He gave it that name, according to Sir M. Foster, "because the sound is not so far from that of 'chaos,' the unformed womb of things." To judge from his writings, van Helmont thought more of his blas than he did of his gas. It is not a little remarkable that the one term should have survived and been extended to include substances far beyond the knowledge of its originator, while the fellow invention has gone into the limbo of the almost forgotten speculations of historic philosophy.

A New Style of Arch-Building.

A peculiar method of building masonry arches is reported by Mr. A. S. Cheevor as having been accomplished on a railway at Bellows Falls, Vermont. The arches were thrown across a ravine, starting from natural rock abutments, which only needed facing up with Portland cement. Instead of laboriously cutting the arch stones to the true voussoir shape, they were only trimmed to a half-inch joint at the intrados; being left to gape 2 inches at the extrados. In forming the arch, strips of wood ½ inch thick were placed between the courses of stone at the intrados; and the spaces above were filled with Portland cement mortar, thoroughly rammed to fill every crevice. The span was 140 feet, with a 20 feet rise. In another case, of a skew masonry bridge of 38 feet span and 45° obliquity, in order to avoid the great cost of cutting skew voussoirs this arch was built with all square joints. The engineers trusted to granite and Portland cement, and were justified. Another bridge was built of large untrimmed rubble stones in cement mortar, exactly as received from the quarry. The only cut stones were those on the faces. The irregular joints were filled in with rammed Portland cement mortar; and on the centring being struck, there was not the slightest settlement.

Brown Coal of Germany.

The recent high prices of black coals have directed attention once more to the brown coal industry of Germany and Austria. Accordingly, Mr. James Stirling, the Government Geologist of Victoria, was lately directed to inquire into and report upon this industry. The net results of this inquiry have been published in the "Iron and Coal Trades Review." Brown coal does not yield illuminating gas; but it is in extensive local demand for a number of other uses, competing fairly well with the native black coal. Victoria possesses large deposits of brown coal, which are as yet untouched. There are three mining centres of the brown coal areas of Germany and Austria; a typical one being that near Cologne, known as the Ville. The deposit here extends about 15 miles long, and 3 miles broad, with a depth running from 3 to 110 yards. The output of the mines or quarries is reduced to briquettes, which cost 5s. or 6s. per ton inclusive at the works. The actual winning of the coal only costs 7½d. per ton. As mined, it contains nearly 50 per cent. of moisture, with 30 per cent. of carbon, 25 per cent. of volatile constituents, and 2 per cent. of ash. The raw coal is broken up, freed from lignitic wood, dried, and compressed into briquettes, which sell in Cologne at 15s. per ton. These are of about three-fourths the calorific value of the Westphalian coal.

Warming of Engineering Workshops.

Some correspondence has been going on in the engineering journals on the question of the best way of warming English workshops, during the changeable English winter season. While there is a growing tendency among employers to concede this addition to the comfort of their workpeople, where the conditions are favourable, some uncertainty prevails as to the best means of accomplishing the object. Agents for American fans and blowers naturally contend for the superiority of a warm air system, involving the propulsion through the shops of large volumes of air at a temperature not far above that of the atmosphere outside. the heat being derived from exhaust or live steam conveyed to the blower in pipes. These arrangements are open to the objection of expense and giving trouble, besides being unsuitable to the English climate and the habits of the English people. Systems of heating that answer their purpose in the hard and dry American and Continental winters are not so successful in England, where the winter temperature may range over 30° Fahr. in the course of a morning, and the air is always well charged with moisture. Besides, the growing use of gas-engines for driving the tools of engineering works is gradually getting rid of both exhaust and live steam in excess. In the circumstances, the most direct means of heating workshops will be found in slow-combustion coke-stoves, of the "Tortoise" order, which can be banked up overnight, so as to have the shop comfortable when the men come in, and let down as the day grows warmer. Gas companies might encourage the use of coke-stoves more than they do, for purposes where gas heating would be too expensive.

Cyanide of Potassium from Bisulphide of Carbon.

According to a statement recently made in "Engineering," the economy of cyanide-recovery processes in coal-gas manufacture is threatened by a new process depending on the use for the same purpose of carbon bisulphide. Potassium cyanide, it is stated, is now made by a process covered by the patent of Raschen, Davidson, and Brock, of which the following is a brief account: Carbon bisulphide, ammonia, and hydrate of lime are located together in a closed vessel, and the solution of calcium sulphocyanide thus obtained is decomposed by carbonic acid and potassium carbonate or sulphate. The dry potassium sulpho-cyanide is then mixed with quicklime and carbonaceous matter, and heated with agitation; and, after lixiviation, it yields potassium cyanide. This process is said to be now in use on the large scale by one of our most important chemical corporations; and to it can be traced the renewed activity in the manufacture of bisulphide of carbon which is noticeable at the present time. The chief difficulty of this trade, however, lies in the transport of such an objectionable fluid, which is subject to many restrictions. The price of potassium cyanide has fallen rapidly of late years, notwithstanding the permanence of the use of the substance for gold recovery. It has ceased, therefore, to interest makers so much as it formerly did. The notable point of the present situation is that established makers of carbon bisulphide will not gain anything by the success of the new cyanide process, because large consumers of cyanide will find it more convenient to make their own. In the waste regions where gold is mined, this manufacture gives the users less trouble than the importation of the compound.

Use of Copper in Pyrometry.

A suggestive paper by Mr. J. W. Richards, on the correction of pyrometric experiments, for heat losses of the apparatus, has appeared in the "Journal of the Franklin Institute." The value of the paper consists as much in its incidental revelations as in the author's conclusions. It appears that the generally-felt need of a cheap and simple pyrometer for checking the temperature of metallurgical furnaces led the writer, so long ago as 1892, to institute experiments, conjointly with Mr. B. W. Frazier, having for their object the determination of the specific heat of copper at high temperatures. The idea was to ascertain if copper could be made available as a substitute for platinum in practical photometry by the method of mixtures—that is, dropping a lump of the metal into a protected vessel of water, and calculating its initial temperature from that of the water. The result amply justified the investigation; for, comparing copper and platinum balls, it was finally determined that the specific heat of copper is

$$Sm\ (o\ to\ t^{\circ}) = 0{\cdot}09393 + 0{\cdot}00001778\ t.$$

By the aid of this formula, copper becomes available for pyrometry for temperatures nearly to its melting point—say, 1000° C., or even to 1050° C., with a degree of accuracy quite sufficient for most technical purposes. This observation suggests a line of investigation for assistants in gas-works, who might without much difficulty construct their own pyrometers for testing the heating of gas-retorts. The apparatus used by Mr. Richards consisted of an inner vessel of brass, covered with paper, resting on three wooden pegs, inside a walnut wood casing, the interspace being packed with cotton wool. The thermometer used to take the temperature of the water at minute intervals is a Baudin, graduated in fiftieths of a degree.

Quality of Texas Oil.

The "Journal of the Society of Chemical Industry" last July contained the text of a paper read before the New York Section of the Society, by Messrs. Richardson and Wallace, on Texas petroleum. The authors state that the new wells are situated near a port on the Gulf of Mexico, to which a pipe-line will be laid. The yield of the largest well is stated at 70,000 barrels per day; but how long it will endure at this rate, and what is the geographical extent of the new field, are open to question. Mr. Robert T. Hill, of the United States Geological Survey, has reported that the importance of the find is far greater than can at present be described or estimated. It means not only a cheap fuel supply to the largest State in the Union, which has no coal; but, owing to its proximity to tide water, it promises an export trade such as exists nowhere else in the world. Preparations are being made to sink hundreds of wells, and very soon the present output of 500,000 barrels a day may be quadrupled. Samples of the Beaumont oil were received from the original Lucas well, taken in January, and again in March last. The results of analyses and examination of these samples showed that the oil differs from both Pennsylvanian and Ohio petroleums. It is high in sulphur, originally containing much sulphuretted hydrogen. This is removeable by standing, and blowing with air; but, after such treatment, the oil contains 1·75 per cent. of sulphur, in the form of hydrocarbon derivatives. While not equal as fuel to the Pennsylvanian and Ohio oils, owing to its low carbon and high sulphur, Texas oil is still a very fair fuel oil, if nothing more. Owing to the high proportion of sulphur, and the fact that it contains a large proportion of unsaturated hydrocarbons, while its saturated hydrocarbons are not satisfactory for illuminants, it is not probable that the Texas oil can be useful otherwise than as a fuel.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Twenty-sixth General Meeting of the Association was held on Thursday at Cambridge, under the presidency of Mr. RICHARD BROWN, the Engineer of the Cambridge University and Town Gas-light Company. The attendance was equal to the best of any previous meeting; and among the visitors was the President of the Gas Institute (Mr. S. W. Durkin).

A CORDIAL WELCOME BY THE GAS COMPANY AND THE MAYOR.

Assembling first at the Lion Hotel, the members were entertained, in a handsome manner, to luncheon by the Chairman and Directors of the Gas Company. To the regret of the visitors, they heard that the Chairman, Mr. E. H. Parker, was away in Norway for the benefit of his health; but it would have been impossible for the Chairman himself to have excelled in the warmth of the welcome which was tendered to the members, on behalf of the Board, by his deputy, Dr. W. B. Redfern, who had on his right-hand side at the head of the table the Mayor (Alderman H. M. Taylor) and the President (Mr. Brown).

The luncheon ended,

Mr. J. CARTER (Lincoln) said the members would be committing an almost unpardonable offence if they departed without expressing their appreciation of the kindly thoughtfulness and the wealth of hospitality with which the Chairman and Directors of the Company had received the Association. Accompanied by a few further felicitous words, he moved that the heartiest thanks be accorded them for their reception.

This was enthusiastically done.

The CHAIRMAN, in the course of his reply, mentioned how pleased and satisfied the Board were with Mr. Brown as their Manager. They placed the utmost reliance upon what he advised them to do; and in most cases they could trust his advice implicitly. If there should happen to be any question at all, they appealed to Mr. Livesey; and in nine cases out of ten, his opinion was that of Mr. Brown.

The MAYOR then addressed a very hearty welcome to the members on behalf of the Corporation and town.

The Business Meeting was held at the Guildhall in the afternoon. During the transaction of formal affairs, the retiring President (Mr. J. G. Hawkins, of Spalding) was in the chair.

The HON. SECRETARY (Mr. J. H. Troughton, of Newmarket), having read the minutes of the last meeting, they were confirmed.

NEW MEMBERS.

On the motion of the HON. SECRETARY, seconded by Mr. H. WIMHURST (Sleaford), eight new members and two associates were added to the roll. Their names are—*Members:* Mr. H. B. Chamberlain, of the British Gaslight Company; Mr. G. F. Cutting, of Haverhill; Mr. J. H. Brown, of Ilford; Mr. F. L. Wimhurst, of Newmarket; Mr. F. W. Torpey, of St. Ives (Hunts); Mr. T. Glover, of Norwich; Mr. C. F. Ruggles, of Leighton Buzzard; and Mr. T. Dann, of Bedford. *Associates:* Mr. E. F. H. Lane, of Billericay; and Mr. E. W. T. Richmond, of London.

THE NEW PRESIDENT.

The CHAIRMAN said it was now his duty to vacate the chair, and his pleasure to call upon Mr. Brown to occupy it during the ensuing year.

On taking the chair, Mr. BROWN had a very gratifying reception.

LETTERS OF APOLOGY.

The HON. SECRETARY next announced that he had a large number of letters regretting inability to be present; among them was one from Mr. George Livesey and another from Mr. W. R. Herring, the President of the Institution of Gas Engineers.

The PRESIDENT then read his

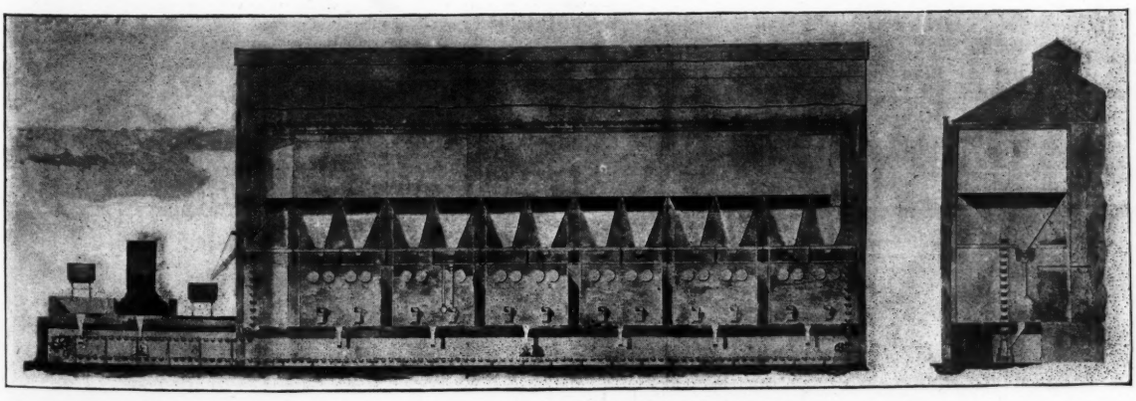
INAUGURAL ADDRESS.

Gentlemen,—The first duty that devolves upon me in taking the chair as your President is to thank you for the honour you have conferred upon me, an honour that I feel all the more deeply as I have only been a member of the Association for a comparatively brief period. We have had the privilege of listening to addresses from my predecessors in this chair, who have all had a longer professional experience than myself; but I can assure you that during my term of office I will do my best for the Association, and trust the proceedings throughout the year will be of benefit to the members. I have heard it said that the preparation of a Presidential Address is not such a formidable task as one might suppose, because there are such a variety of subjects to select from. It is just this variety that makes the work difficult—it is difficult to get away from the beaten track, and find something to say that has not been previously treated upon, to interest those members who are in charge of small works as well as those in charge of the larger ones.

For several years past few presidents of meetings of gas engineers have failed to devote a considerable portion of their remarks to a consideration of the effect that the extension of electric lighting would have on illuminating gas. In many cases the claims put forth by the electricians showed our friends were not overburdened with conscience in making their statements. But they were met in perhaps too aggressive a spirit by the champions of gas. We are now more disposed to look on the competitive illuminant with almost serene indifference, due to the fact that the demand for gas continues to grow owing to the uninterrupted increase in its use in cooking and heating appliances.

We ought not, however, to neglect keeping ourselves informed regarding the methods our chief competitors employ to dispense with labour. In this respect, electrical engineers have had the privilege of designing and building new works, and have therefore been able to avail themselves of all the advantages which such favourable conditions lend themselves to, whereas with ourselves it is our lot, with very few exceptions, to only reconstruct old works, which, owing to the necessity of keeping up the supply of gas, can only be done in sections.

The electrical engineers have taken advantage very largely of the mechanical coal-handling appliances now obtainable; and I fear in this respect, great as has been the adoption of like appliances in gas-works, it has been far more complete in electric lighting and power stations. Through the courtesy of one of the conveyor speciality companies, I am able to put before you the drawings of the coal and ash conveying plant at the electric power works at Newport, Mon. The conveyor is what is known as the gravity bucket tilting conveyor. The buckets are pivoted in the chain, and are kept upright by gravity; consequently the chain can be run horizontally, perpendicularly, or at any angle, without affecting the working of the buckets. This form of conveyor is popular among electrical engineers. The drawing needs but few remarks from me to describe the method of conveying the coal and ashes; the arrangement being typical of the thorough systems of coal and ash handling in use in many electric light works. The coal is tipped from the waggon into a hopper arranged over a portable filler. This filler is a continuous feed, the coal filling each bucket as it passes; and it is suitable for all sizes of coal. When the filler is not in use for the coal, it is moved along in front of the boilers to fill the ashes in the same way. The coal is carried to the coal bunkers over the boilers, and any bucket can be tipped and its contents discharged into any part of the storage. The ashes are carried in a similar manner, and emptied into the ash hopper, to be removed by waggons.

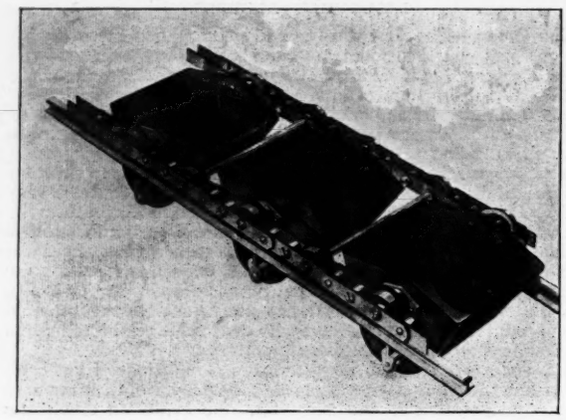


COAL AND ASH HANDLING PLANT AT THE NEWPORT (MON.) ELECTRICITY WORKS.*

One of the most prominent features of recent years has been the steady improvement in the design of elevators and conveyors

* The indifferent appearance of the three illustrations with asterisks (above and on next page) is due to the fact that they are reproductions of photographs of coloured drawings.

to distribute the coal to hoppers to supply the charging machinery for horizontal and inclined retorts. Coal elevators and coal conveyors are now about as perfect in design and construction as engineering ingenuity can make them, and none of us who have had experience of these efficient labour-saving appliances hesitate to apply them in every possible way in our coal-stores and retort-houses, in order to dispense with manual labour and reduce the cost of carbonizing.



Gravity Bucket Conveyor and Elevator.*

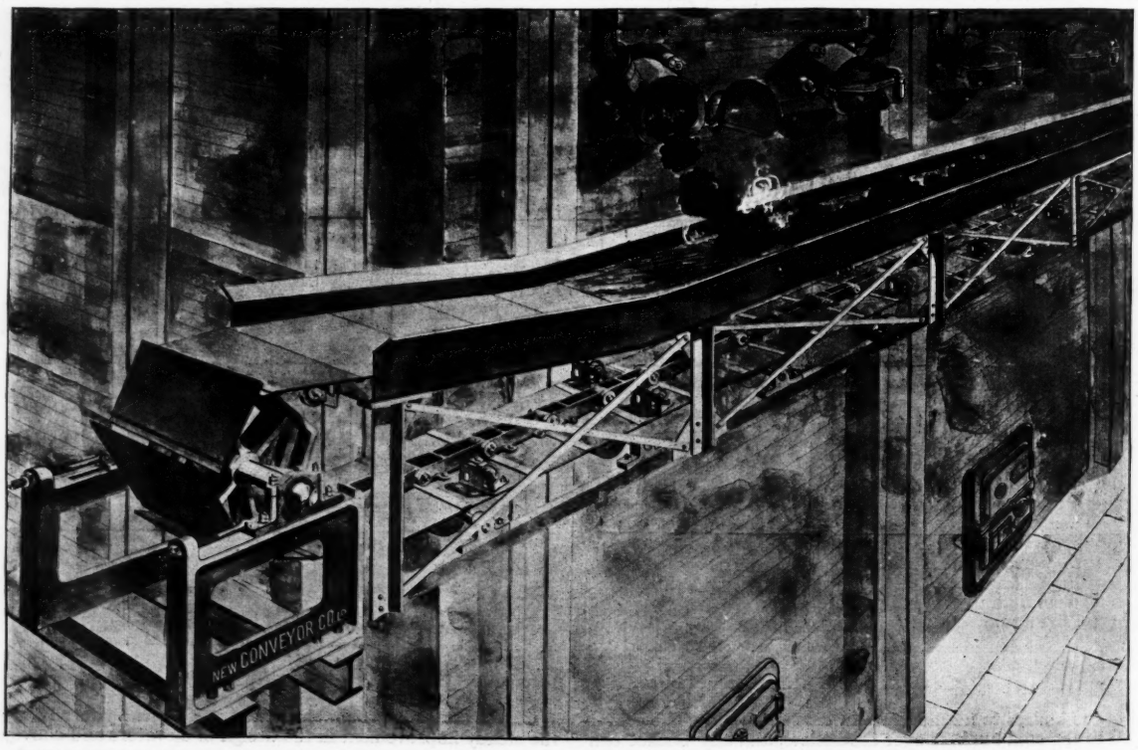
Although there has been this wide and generally successful adoption of conveyors for coal, the wheelbarrow for the removal of coke is still too much in evidence in retort-houses. From my recent inquiries regarding hot-coke conveyors, I believe we are on the eve of a vast extension in the use of these mechanical carriers, to take away the hot coke automatically as it is discharged from the retorts. My reason for anticipating a wider adoption of hot-coke conveyors is the substantial improvements I have seen in the design and manufacture of these mechanical carriers. In some of the earlier designs the chains were completely worn out in a few months. Two causes contributed to the short lives of these earlier types: (1) The light design of the chain, and (2) the dragging of it through the coke. I cannot conceive any form of chain doing satisfactory work for any length of time when dragged through a trough filled with such a triturating material as coke. There are few more wearing materials than coke, and the chain and other parts, if of light construction, cannot but quickly get awry in operation—out of pitch—and require constant repair or frequent renewal.

Careful reflection has led me to the conclusion that the correct method to automatically remove such a grinding and wearing material as coke is to carry it. Last spring I had the opportunity of inspecting various works throughout the country, in order to see the latest inclined retort installations, and I also looked into the matter of the working of coke conveyors. The drawing before you represents the appliance I saw carrying the coke gently and free from breakage, and with results as to wear and tear that removed from my mind the prejudices which weak chains and flimsy working parts had created. The trough is made of heavy steel, and is 24 inches wide. In this trough the coke-carrier, formed of joggled steel plates attached to a massive pitched chain, bears the coke along to hoppers, waggons, barges, or storage yard. The steel-plate band, on which the hot coke is carried, is immersed in water, which prevents buckling of the plates. The little scrapers fixed on the under side of the carrying steel band perform the double service of keeping the pathway for the rollers and the trough clear of breeze and dirt. The arrangement of rollers in the rear of these scrapers, and independent of the chain, I consider another improvement, as these rollers ensure an even surface on the travelling steel plates, besides preventing the chain from dragging on the trough, thereby obviating friction and wear on the chain. Further description of this conveyor is needless, as the drawing is self-explanatory. I need only add that its design and construction, and the satisfactory assurances I was given by engineers as to its working, are grounds for my belief that conveyors for coke will soon be as extensively used as they are at present for coal, and a further reduction made in the cost of carbonizing, in addition to enabling us to dispense with the most trying and laborious kind of work in our retort-houses.

During the past twelve months another competitor, in the shape of Mond gas, has appeared in our midst, and caused considerable trepidation among gas engineers. But surely the alarm is unnecessary; our industry being in no more peril of extinction by this new competitor than it is by our electrical friends. It appears to me more like a blessing in disguise, as Mond plants can only be erected in large manufacturing districts, where power gas will no doubt largely supplant steam; and by its adoption manufacturers will be able to reduce the cost of producing the numerous materials that we require in our undertakings.

I believe the subject has not been dealt with at our or any other gas engineers' association; and I have therefore much pleasure in giving you some particulars of this interesting gas, for which I am indebted to Mr. H. A. Humphrey, of Messrs. Brunner, Mond, and Co., Limited.

Mond gas, although only lately brought prominently under the notice of the general public, since the passing of the Bill, is not new, as it is twenty-two years since Dr. Mond first erected a plant to convert ordinary slack into fuel gas, while nearly keeping the original heating power of the fuel and recovering the bye-products from the same. For some years the difficulties were great; but Dr. Mond successfully overcame all obstacles, and he now obtains an excellent gas of uniform quality, free from tar, soot, and dust, and with less sulphur than from any ordinary



Proposed Hot-Coke Conveyor for the Cambridge Gas-Works.*

producer, the calorific value being some 84 per cent. of that of the fuel used. And, extraordinary as the statement may appear, it is an absolute fact that for every ton of fuel used the volume of gas varies from 140,000 to 160,000 cubic feet. It is suitable for every class of furnace work and for gas-engines, and, in addition, ammonia equal to 90 lbs. of sulphate is obtained if the process is carried on on a large scale. But for small plants, for gas-engines of, say, 250-horse power, the outlay would not warrant the erection of a special plant for the recovery of the ammonia. The manufacture of this gas at its birthplace, Winnington, Cheshire—where 150 to 230 tons of fuel are gasified per day, and the consumption will equal 1,000,000 cubic feet of gas per hour—is done entirely without a gasholder or any other storage. The demand, of course, varies considerably, as in our own case; but the gas supplied is always equal to the gas produced, as the working is controlled automatically.

The fuel to be converted into gas is all handled in the modern way, by elevating and conveying machinery. It is elevated to overhead hoppers, from which it is fed into the producers in charges of from 8 cwt. to 10 cwt. at a time, where the heating takes place. The products of combustion pass downwards into the hot zone of fuel before joining the bulk of gas as it leaves the producer, in order to destroy the tar and convert it into a fixed gas. This also prepares the slack to descend into the body of the producer, where it is acted upon by a superheated air blast saturated with steam at 85° C. (185° Fahr.). The amount of steam introduced with the blast is a large quantity, being 2½ tons per ton of fuel gasified. It is absolutely necessary that this amount should enter with the blast, in order to keep down the temperature of the producer so as to prevent the formation of clinker and preserve the ammonia from destruction. But such temperature does not prevent the fuel from being thoroughly burned to a fine ash.

A large amount of free hydrogen is obtained by about ½ ton of steam being decomposed in the producer; and of the undecomposed steam about 1 ton per ton of fuel gasified is returned to the producer. The hot gases and undecomposed steam on leaving the producer pass through tubular regenerators, the incoming blast being in the opposite direction. Here heat is exchanged, and the blast is further heated by passing down the space between the two shells of the producer on its way to the fire-grate. The hot gases are then "washed" in an iron chamber by a water-spray, and the steam and gas are cooled down to about 90° C. (194° Fahr.), when they pass to the ammonia recovery plant—this process being of the continuous type. The gas being freed of its ammonia is passed into a cooling tower of cold water, which further cleans and cools the gas before passing to the main. This cooling candenses the steam, and so heats the water. The water leaves the bottom of the tower hot, and is used in another tower, through which the blast is directed, in order to heat the air. The great economy of the plant arises from the utilizing of the heat of the gas from the producer, and steam being added to the fuel an exchange of heat is always going on. The charging and drawing of the producer in no way interferes with its continuous working, and the system has the great advantage of being able to produce a largely increased quantity of gas at short notice.

The analysis of Mond gas (dry) is given as follows:—

	Volume Per Cent.
CO	11
H	29
CH_4	2
CO_2	16
N	42
	100

Specific gravity, ·7882.

The passing of the Mond Gas Bill last session will give a great opportunity for a section of the public to invest their surplus capital, as the promoters intend to take immediate advantage of their powers. The capital expenditure for the five South Staffordshire central gas stations is estimated at £789,656. The stations will be approximately five miles apart, and the gas will be distributed in mains of various diameters, up to 30 inches. The total quantity of gas which will be delivered into the mains per day will amount to 84,000,000 cubic feet. The four outside stations are connected with the centre station by trunk mains, so that should it be required to shut down any one station it can be done.

The pressure at the stations will be 7 lbs.; and this will be obtained by steam-driven rotary blowers, the exhaust steam from which is used for saturating the producer blast, showing how thoroughly every detail has been considered in order to economize in the working. The pressure will be ample to meet all requirements, as at the most distant point of the trunk main 3 lbs. will be maintained, and at all branch mains 2 lbs.—there being automatic regulators at each junction between trunk and branch mains.

The last traces of tar will be removed by means of special centrifugal purifiers, which Mr. Humphrey informs me have been most successful at Winnington, as by these purifiers the gas has been cleaned so effectually that the gas-engines have run six months day and night without cleaning the valves. I am afraid that with our rich illuminating gas we are unable to claim so excellent a result.

The following is the estimated cost of Mond gas for the South Staffordshire plants for one year:—

	Total.	Cost per 1000 Feet of Gas. Pence.
Cost of slack (total for gasification and steam raising), 225,000 tons at 6s.	£67,500	0·6428
Manufacturing, wages, repairs (wages and materials, including renewals), gas for lighting purposes, lubricants and stores, sulphuric acid	39,377	0·3750
General expenses, including salaries, rates and taxes, &c.	15,300	0·1457
Gross cost at works	122,177	1·1635
Less residuals	66,660	0·6348
Net cost at works	£55,517	0 5287
Compression and distribution, including renewals, repairs to mains, meters, &c., salaries and inspection	29,375	0·2800
Total cost	£84,892	0·8087
	say £85,000	
10 per cent. on capital	—	0·9524
Total		1·7611

From these figures you will see that there is a marked difference between the cost of producing this gas and the illuminating gas we make; and even these figures are higher than the cost of producing gas at Messrs. Brunner, Mond, and Co.'s works.

But this is not the only new competitor that we have to face in the matter of supplying gas for heating and motive power, as the waste gases from blast-furnaces, having an enormous calorific value, have been remarkably successful as gas-engine fuel. To Mr. B. H. Thwaite belongs the honour of discovering this new source of power; and, like many great discoveries, it was partially accidental. This gentleman was analyzing gas from his producer, and was struck with the similarity of his power gas to the blast-furnace gas. The pioneer experiment of driving a gas-engine with the latter gas was tried with an "Otto" of 20-horse power at the Wishaw Iron-Works, Lanarkshire, with successful results; and the engine is still in operation, driving an electric light plant for the works. Since then the system has been taken up at other places in this country and on the continent. At the Wishaw works, the Manager claims he secures 12⅜ E.H.P. with a gas consumption of 105½ cubic feet, corresponding to a fuel consumption of 1·26 lbs. per E.H.P., or to 0·945 lb. per I.H.P., on the basis of 180,000 cubic feet per ton.

Now, in view of the particulars to which I have drawn your attention, we naturally consider whether our industry will be affected by this increased competition. I am bound to say we have been too ready to conclude that these power gas companies will interfere with our business to any great degree; and I believe in years to come we shall more likely find them supplanting steam power than our illuminating gas. Besides, during the last few years, a means has been placed in our hands to decrease the cost of production, in the shape of water gas, although no one thought of its possibilities before Professor Lewes's valuable investigations, which he placed before us in London last year, and the working experiments at the Engineering Congress at Glasgow last month. He has shown us that by the judicious use of water gas we can obtain a great increase in the make of gas per ton of coal carbonized, and a corresponding cheapening of our gas, to the mutual advantage of ourselves and the consumer. Of course, the illuminating power would be reduced; but Parliament has already shown a willingness to reduce the quality of lighting gas if an equal advantage can be conceded to the consumer in the matter of price per thousand cubic feet.

For many years we had no competitors to face; and I am not at all sure that such a state of things was conducive to the advance of our industry. Gas engineers of that day had nothing to stir their energies, and were content to be Rip Van Winkles. But with the advent of the electric light, the awakening took place; and now, with other possible competitors springing up around us, we must be more ready to adapt ourselves to the new order of things and dispense with the old, however much they may be endeared to us. We must not copy the attitude of the ostrich, burying our heads in the sand and refusing to face unpleasant facts, but we must face them boldly, seeking in every possible way to discover further means of cheapening the cost of production and making more use of labour-saving appliances. By such means as these our great industry has succeeded in the past; and by these means it will continue to succeed in the future.

Before closing this address, I cannot help expressing my disappointment at the presumably abortive negotiations that have now been going on between the Institute and the Institution for some months towards that much-to-be-desired event, the amalgamation of the two Societies—an event, I am certain, which is earnestly desired by the large majority of the members of both bodies. It is a perfect puzzle to the outside public that such an important body as the gas engineers of the kingdom should have two Associations, each claiming to represent the industry. Our counsels being divided, we do not carry that weight which we should if we could show an undivided front. No doubt there are considerable difficulties for the two Councils to surmount, but has there been sufficient "give and take" between the two bodies to settle the points at variance? Surely at this stage in the history of our industry we should sink all personal feelings we may have in the matter, and unite in forming one strong Association, always remembering that good old adage, "Unity is strength."

On the proposition of Mr. W. J. CARPENTER (Yarmouth), seconded by Mr. J. BARTON (Peterborough), a hearty vote of thanks was passed to the President for his interesting address.

The PRESIDENT, having made suitable acknowledgment,

Mr. W. J. CARPENTER read a paper, entitled—

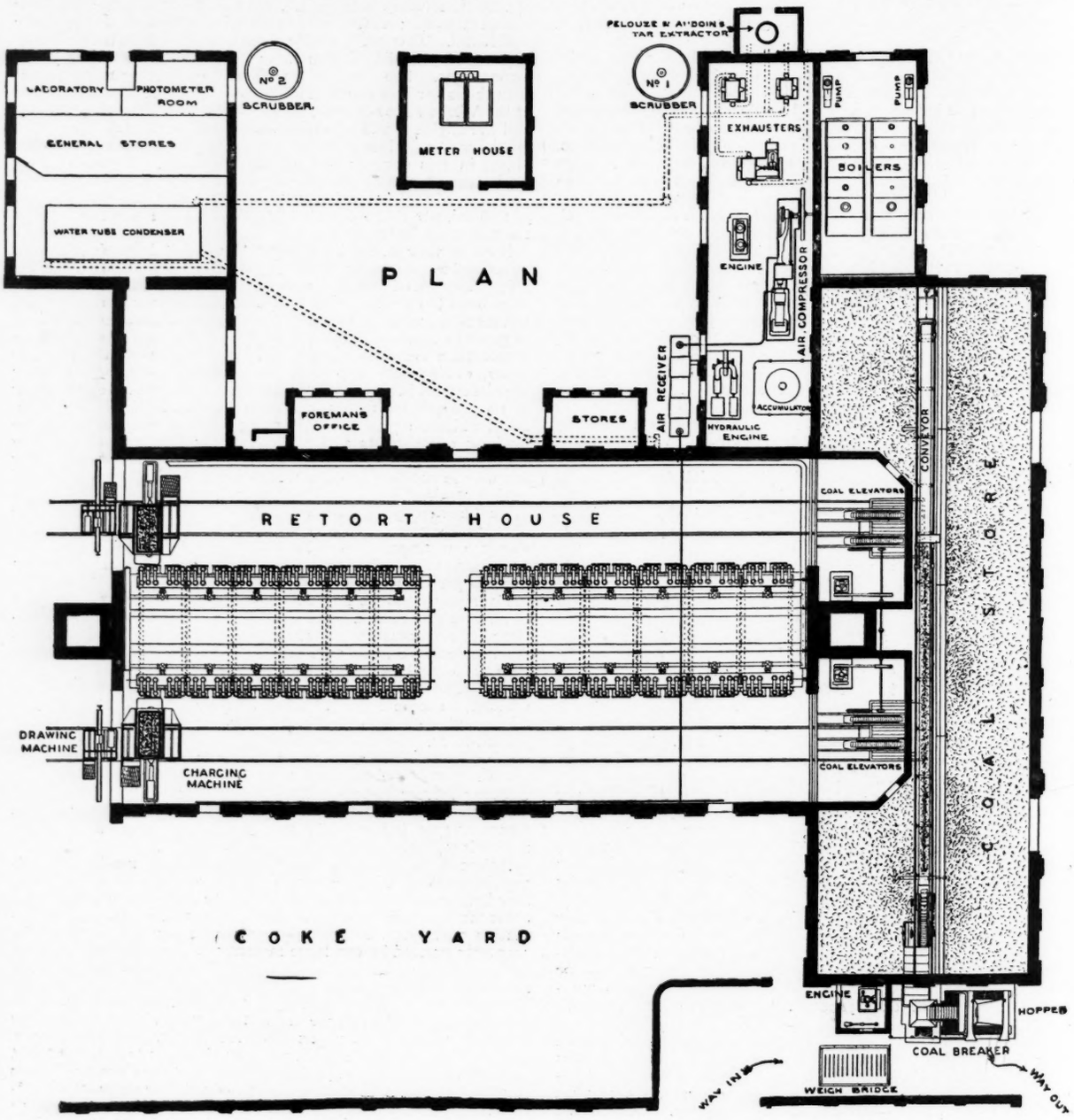
COAL UNLOADING AND STOKING MACHINERY AT THE GREAT YARMOUTH GAS-WORKS.

For many years, and up to within three years ago, the coal required for consumption at the above works was delivered by sailing colliers of 250 to 450 tons carrying capacity, with an occasional vessel of 700 tons burden. The unloading of these boats was accomplished by means of the well-known whipping arrangement so long customary in the various ports of this country. After having been weighed in 1 cwt. scales, the coal was placed in sacks, carted to the works, carried up plank-ways, and deposited in the stores by ordinary labourers. This system, antiquated as it sounds by description, answered well enough when the coal used was not so great in quantity; but it presented increasing difficulties as the total of coal required continued to grow. The rate of discharge was inadequate, and the kind of men required to work the vessels not always obtainable; moreover, the cost was felt to be excessive, when compared with other works employing more up-to-date means—all points for serious consideration. It was therefore decided to endeavour to bring machinery to our aid, and, if possible, cheapen the cost from vessel to store; or, in other words, to make machinery do the work, pay its way, improve the dispatch of the colliers' vessel, and save something in the bargain.

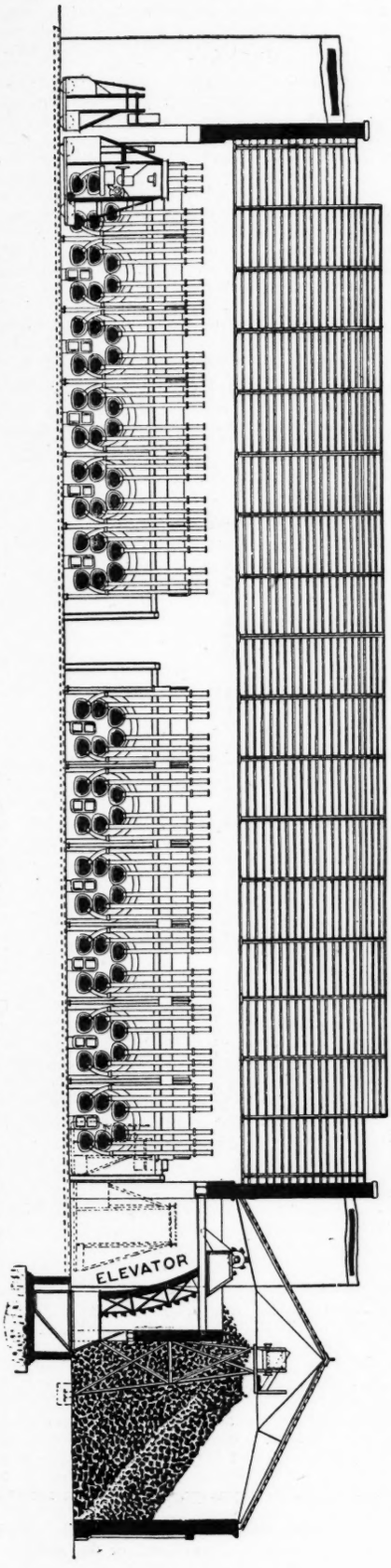
The application of machinery was not such an easy matter as it would appear at first. The works and stores are situate some little distance from the quay side. We have no quay of our own; the sufferance quay available being contiguous to, and, in fact, forming part of, the Fish Wharf—a very busy place during some months of the year, and consequently zealously guarded by the Corporation, to whom the Fish Wharf belongs. To begin with, application was made to the Corporation for permission to put down a line of rails along the available quay side, the length of which is 300 feet. We proposed to employ a crane actuated by hydraulic power, with the usual tipping skip, suitable carts to be provided to receive the coal and convey it to the works, where coal breaking, elevating, conveying, and distributing machinery was in contemplation.

This concession was not obtained very readily. The anticipated increase of coal dust likely to be caused by tipping large quantities of coal in close proximity to the herring wharf, the probability of fish salt being discoloured (the salt ships are unloaded in adjacent berths), and a general disinclination to give up any rights to the quay, being freely put forward as arguments showing reasons why the application should not be entertained. However, recognizing the common-sense side of the question, we agreed to undertake that no coal tipping whatsoever should take place at the quay side; and with this condition made imperative, the required permit was granted. The rails, hydraulic power pipes, with hydrants at frequent intervals, the crane fitted with moving or travelling gear, return water-pipes to the pumping-engine tank, and the pumping engine and accumulator were then speedily proceeded with.

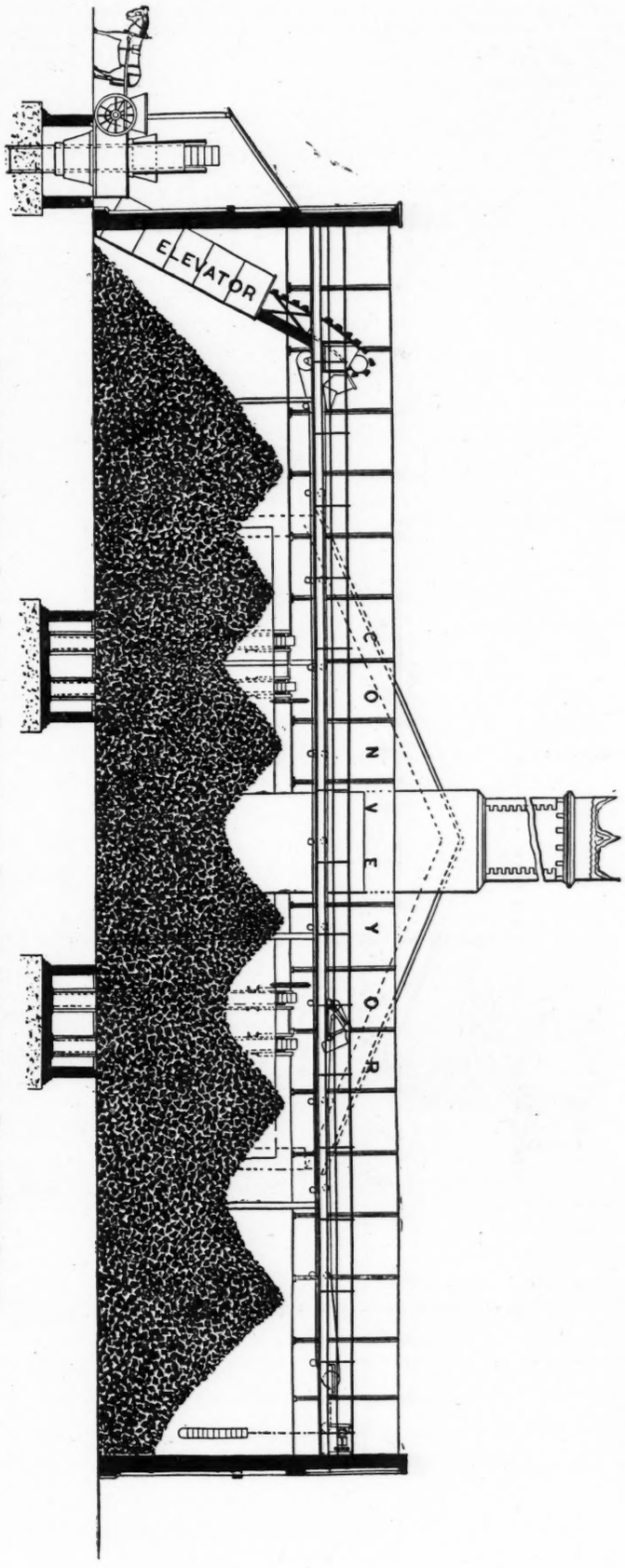
As seen by reference to the plan, the pumping engine and accumulator are placed on the works near the boiler and the



PLAN OF THE GREAT YARMOUTH GAS COMPANY'S WORKS.



SECTION OF RETORT-HOUSE AND COAL-STORE, SHOWING WEST'S COMPRESSED-AIR STOKING MACHINERY AND COAL-ELEVATORS.



SECTION OF COAL-STORES SHOWING COAL-BREAKING, ELEVATING, AND CONVEYING MACHINERY FOR FILLING COAL-STORES.

power transmitted thence, through about 350 yards of pipes, to the crane. The return water-pipes are laid in the same trench as the pressure-pipes. The system to be adopted for conveying the coal from the crane to the coal-store had received considerable attention; the traffic in both instances of permanent railway and fish carting traffic having to be crossed. Many and various ideas were suggested and given attention. Enumerated they are as follows:—

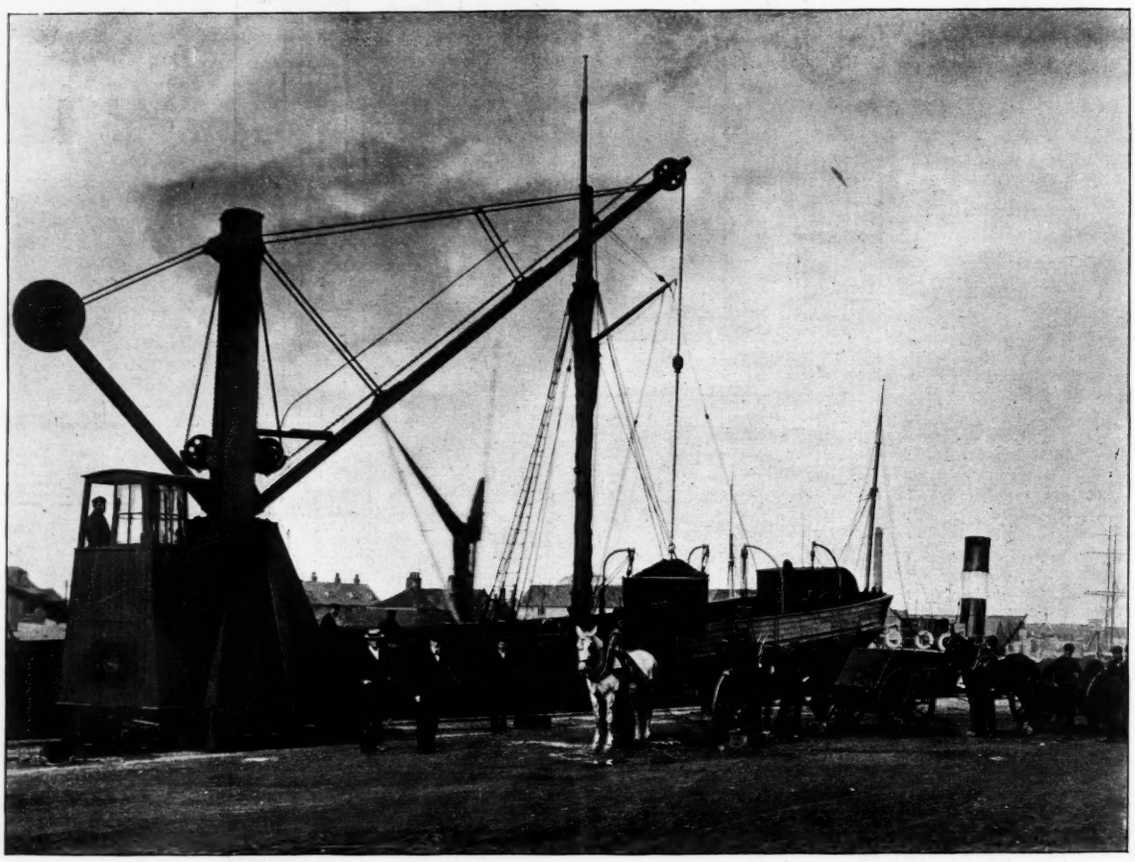
1.—A line of rails with narrow-gauge locomotives and waggons.
2.—Electric traction.
3.—Overhead wire and tipping buckets.
4.—Underground, or a tube as it is popularly called.
5.—Carting with carts specially constructed to receive the coal-tanks.

Upon mature consideration, it was found that, in instances 1 to 4, although offering many advantages, the capital outlay was out of all proportion to the work to be done; and ultimately the horses and carts idea was decided upon as the cheaper and better method, meeting the local circumstances of traffic more easily and readily. We are glad to say, after our experience in working, that we were not far wrong in our calculations; the fish traffic in the busy season being more than one would really contemplate from casual observance.

Having got so far, the cart was designed in such a manner that the coal-tank formed part of it, as seen in the photograph. It is simply a frame made to receive the tank, upon which are tipping centres, with the necessary catches to prevent overturning when being driven loaded to the coal-elevator pit. The tanks are readily filled in the ship's hold, lifted by the crane, and deposited in the cart frames—16 cwt. of coal being the load. Thence the carts proceed to the elevator, passing over the weigh-bridge on the way, the driver pulls or disengages a catch, and the coal is tipped into a pit, where an elevator is provided to lift the material into the coal-breaker.

It will be noticed here that we have an elevator to lift the coal to the breaker, and the idea will suggest itself, Why not tip the coal direct into breaker? The explanation is that Yarmouth is built upon sand, forming excellent foundations while the weight is carried or placed upon practically the surface, but very difficult to deal with when down a few feet and water is met with. The sand runs, and is to all practical purposes bottomless—on our site, at all events. The breaker could not therefore be fixed low enough to enable the carts to be tipped into it; and an elevator was arranged to take any ordinary sized coal as from the colliery and deposit it into the breaker, which reduces the coal to 3-inch cubes. After this, no further breaking is necessary.

Passing through the breaker, a second elevator is provided, to deliver the coal to a conveyor fixed in, and running the whole length of, the coal-store roof, as shown on plan. This conveyor is a cotton duck belt, running on rollers, with a tipping carriage arranged to throw the coal off at any required point. We are much impressed with this form of conveyor. It is simple, inexpensive, and not calculated, as found by experience, to get out of order. We have unloaded, in round figures, 40,000 tons of coal since the commencement of the system; and there is no apparent wear shown by the belt, beside which no trouble has been met with in conveying the 30 to 35 tons per hour required of it.



Method of Emptying Ships, with Coal-Tanks and Framework Carts in Foreground.

The whole of the coal unloading and distributing machinery being complete and satisfactorily at work, the following figures will show fully the difference in cost of working between the old and the new arrangements—taking, for example, an instance of a vessel containing 700 tons.

Old System.

No. Men and Horses Employed.	Tons Unloaded per Day.	Cost per Ton Delivered into Store.
39 men, 6 horses	165	20½d.

New System.

18 men, 4 horses	230	10½d.

Or a saving of 10d. per ton of coal unloaded—a welcome economy during the period of high prices recently ruling for coal.

Having succeeded so far with the completed coal unloading appliances, it was decided to go forward with the stoking machinery, the complete arrangement of which is set forth on plan and illustration. In working out this scheme, the grand idea always borne in mind was that of handling the coal as little as possible on its way from the ships to store, thence to the stoking machinery, and again, as coke, to the yard. If the illustration is studied for a moment, it will be noted that the crane having delivered the tank to the cart, the elevator and conveyor receive the contents, depositing same in such position that the charging machinery elevators are fed easily with little, if any, manual labour; and having a fairly regular supply, the greater part of the coal used finds its way, by its own gravity, direct to the receivers, and is sent forward to the charging-machine.

The general scheme of elevators and engines—both in duplicate—is the result of some considerable amount of deliberation, in which we were greatly assisted by the Engineer of the contracting Company. As a rule, in retort-houses fitted with machines, overhead hoppers are arranged, each with one elevator responsible for its supply of material. In arranging machinery to suit the conditions of existing retort-houses, it is not always found practicable to apply a fixed principle; and in our own case, the coal-store being at end of retort-house, with the gable and roof

very much in the way of arrangement of the fixed principle, the matter looked like being expensive and difficult of satisfactory accomplishment. After carefully thinking it out, we proceeded to adopt the system as shown, embracing two elevators on either side of the retort-house, delivering the coal direct into the charging-machine hoppers, with engines in duplicate to avoid risk should any breakdown occur.

These elevators can be driven separately or coupled as wished, providing safety in the event of a broken chain or other accident—always to be prepared against in machine work. The risk is therefore minimized, and no delay occurs in the working—a matter of vital importance in stoking machinery installations. The arrangement, moreover, allows of short elevators being employed, reducing the wear and tear—short elevators being employed in place of the long ones generally in use.

The charging and drawing machines are actuated by compressed air—perhaps the best and safest power to apply to machinery in retort-houses. They are of the manufacture of that well-known Engineer whose name has been so long associated with the successful introduction of labour-saving machinery—Mr. John West. The charging-machine hopper has been increased in capacity to meet our case, and contains sufficient coal to charge 18 to 20 retorts. As the double elevators lift coal at the rate of 16 cwt. per minute, we find no difficulty whatever in working without overhead hoppers. These charging-machines have the great advantage of not only delivering any quantity of coal desired per charge, but placing the coal in an even layer throughout. They are easily manipulated, and very rapid in the time taken to perform their work.

The hoisting and adjusting of the charger to suit the various tiers of retorts, and the travelling movements, are effected by a compressed air motor. We think it a wonderful little motor, as, in our experience of similar instruments, there have been many weak points liable to most expensive repair. These motors have been running continuously, so to speak, for about eighteen months, and have required no attention whatever. The charging-scoops, provided with reversing movements, &c., are actuated by a ram and compensator, all being made of strong workmanship suited to stand the rough and dusty atmosphere of hot retort-houses.

The drawing-machine is also strongly made; and after a little training, the men can quickly draw the charge with little or no physical exertion. We find a great advantage from using swinging, as against fixed, rake-heads. Our coal is given to swelling during the process of carbonization, increasing considerably in bulk when drawn as coke; so that frequently we have but an inch or so between the top of charge and top of retort. The swinging rake-head successfully gets over the difficulty; and we are therefore able to maintain our make per mouthpiece, whereas there would be a certain drop if ordinary rake-heads were in use, or hand labour employed.

The air-compressor providing the power required is placed, as shown on the drawing, near the boilers, and is automatically driven. There is a very ingenious governor attached to the steam and air pipes. This governor automatically part-closes the steam way, just keeping up momentum, when the pressure of air is at its required point; and automatically admits steam to the cylinder when the pressure falls. The compressor is fitted with an expansion valve and mechanically closed air-valves. The automatic driving is an important feature in our instance. We have not incurred any expenses for extra drivers, either with this compressor or the hydraulic engine—both being self-contained.

Having described the general features of this machinery installation, it will perhaps be as well to deal with the reasons which prompted us to undertake power machines in a concern carbonizing but 15,000 to 16,000 tons of coal per annum, seeing that it is often set forth that machinery cannot possibly pay unless a great deal of work is found for it to do. We were in this position: The Yarmouth Company had increased its consumption of coal in a marked manner during the past few years, and much of the increase occurs in the hottest and the most trying weather. Successful visiting seasons with us, like others no doubt, mean full employment for labour; and full employment for local labour brings about a certain independence of the men, or at any rate disinclination to leave Yarmouth beach to take up gas stoking as a means of livelihood. All these things were tending to disinterestedness, with its consequent bad results; and, again, there appeared to be looming in the distance the craze of shorter hours. We knew that the latter was an impossibility with us; and being determined to maintain, if possible, our carbonizing record, power machinery, which would place us beyond the necessity of employing the kind of men necessary for scoop work, was decided upon, and we have had no cause to regret having come to this decision.

Briefly, then, we find that we can carbonize our coal cheaper—the cost per ton working out at about 1s. 6d. to 1s. 8d., as against 2s. 6d. by hand; and our retorts are producing a considerable quantity more gas each than when charged by hand scoops. There is, of course, a saving in wear and tear and fuel from this cause. We therefore think that it is fairly demonstrated that power machines can be, and are, successfully employed in medium-size works.

There is one other point—perhaps the strongest, as it appeared to us—in favour of power machines, or at any rate machinery of any kind designed for the reduction of the heavy and exhausting work of the retort-house, and that is the humanitarian point of view. We cannot with impunity overlook the fact that there is about as much trying, hard work in stoking as is to be found in any sphere of life; and it therefore behoves us to persistently advise our directors or committees, as the case may be, to adopt means to bring about the alleviation of the more arduous labour of the men employed in the retort-house. It is, in point of fact, a duty which directors or committees of the present day, in order to make up for a good deal of the apathy of their predecessors, should look to more closely in the mutual interest of master and man.

At the close of his communication, Mr. CARPENTER suggested that, as the contribution which was to follow was on a cognate subject, it should be at once read, and the two discussed together.

The suggestion was adopted, and

Mr. E. W. SMITH (Chelmsford) proceeded to read the paper, which bore the title

THE IMPROVEMENT IN CARBONIZATION DURING RECENT YEARS.

Of the many branches of gas manufacture and supply, there is not, perhaps, one of so much importance and interest, and which call for so much attention—bearing as it does on the economy of gas-works management—as that of carbonization, with its various means and methods. In selecting it as the subject of a paper, I do so in the hope that some little good may be derived from a discussion of it—at least by the managers of small and medium-sized works, of which we have many in the Eastern Counties. From this explanation, it will be seen that "improvements during recent years" need not necessarily include the introduction of inclined retorts, stoking machinery, or any of the costly, but (we may admit) very efficient, methods now in operation in large undertakings. Nor is it the writer's intention to do so, but to confine his observations to those developments which may come within the reach of most, if not all, of us.

That very great advance has been made in carbonization generally, even the most contentious of those among us would, I think, admit. Yet, notwithstanding what has been done by many gas undertakings, there are still a large proportion, as I shall endeavour to show, "muddling through" on old-fashioned and wasteful methods. It may be for pecuniary reasons, and it may be, in some cases, due to over-cautiousness on the part of a few gas companies. But whatever may be the reason, the writer holds that it is the province and duty of such an Association as this to do its best to show that nothing should stand in the way of all engaged in the manufacture of coal gas breasting forward into line with those who have held to the front so well during latter years, and thereby, through the stimulating influence that such a state of things would bring about, still further helping forward the advance that has already been made in the economic production of gas.

When we reflect what has been done at Widnes, we must admit that gas can be made and sold cheaply even by small and medium-sized undertakings whose output and financial position preclude the employment of inclined retorts, water-gas plant, or stoking machinery to bring about that end. Therefore, another contribution—for there have been many already—dealing with the advantages of gaseous firing may be acceptable to you. At this point, the writer may state that it is not his intention to again go over old ground by explaining the technical side of the question. But he would advise those who may still be in need of such information to peruse the exhaustive and masterly paper read by Mr. W. R. Chester at the meeting of the Gas Institute in 1894. He will, however, endeavour to show that, notwithstanding the general improvement that has taken place, much more requires to be done, and may be done by bringing this matter forward once again.

Any one given to scanning the annual returns relating to gas companies and gas undertakings under local authorities, must have been struck with the improvement referred to. The following figures, representing the total quantity of coal carbonized and gas made, with the average yield per ton, of some 35 works making between 20 and 50 million cubic feet of gas per annum, for the years 1887 (probably before gaseous firing was introduced into any of them) and 1900, give some little idea of what this improvement is:—

	Coal Carbonized. Tons.	Gas Made. Cubic Feet.	Yield per Ton. Cubic Feet.
1887. . .	107,482 ..	1,063,405,000 ..	9,893
1900. . .	184,458 ..	1,850,171,000 ..	10,030

As, so far as the writer is aware, very few of the works included in the above use gaseous firing in any form, it may be assumed that for some reason or other the management of such undertakings have been stimulated to produce better results; and as no such improvement is shown during any preceding similar period, one can, without stretch of imagination, attribute the better state of things to the spirit of emulation which pervades the breasts of us dwellers in this insular land. It is our birthright, and we look to its impelling us on to greater things. But the stimulus was needed; and it doubtless came with the introduction of regenerative settings into larger works.

The greatly increased yield of gas per ton of coal, with the equally as great decrease in the consumption of coke used in heating the retorts, set men a-thinking; and before many years from the introduction of gaseous firing (about 1880) the system found its way, in some form or other, into smaller works, and had its effect more or less upon all. A further reference to the annual returns enables us to see more clearly the effect. By following a

process of selection—taking only from the list of figures already given those undertakings that are known to have adopted the improved methods—we find that the aggregate results of a few works carbonizing between 2000 and 5000 tons of coal per annum give the following:—

	Coal Carbonized. Tons.	Gas Made. Cubic Feet.	Yield per Ton. Cubic Feet.
1887 . . .	15,940 ..	158,167,000 ..	9,922
1900 . . .	22,583 ..	238,969,000 ..	10,582

It is well worth noting that the average yield for the year 1887 of the above referred-to number of works is fairly high as things went then, which leads one to think that those undertakings were in charge of capable and zealous managers; and one almost feels tempted to single out such men for special commendation and praise. The above figures speak for themselves, and should clear the air for any of those who may still be hesitating about adopting the methods of which others have proved the benefit, and which to-day can hardly be described as "new."

But the annual returns reveal even better results if the list be extended to include larger concerns, as the following totals will show. In this case, the figures are taken from returns made by works ranging from a make of about 6 up to 160 million cubic feet per annum, and represent in all 60 of the best results obtained per ton of coal carbonized, by undertakings up to the size given, for the year 1900:—

Coal Carbonized. Tons.	Gas Made. Cubic Feet.	Yield per Ton. Cubic Feet.
261,900 ..	2,776,980,000 ..	10,602

That there should still be in use a great number of direct-fired settings, and many of these even of most inefficient arrangement—as one might easily imagine to be the case—is to the writer inconceivable, inasmuch as there would seem, even for pecuniary reasons, no excuse for continuing on the old and wasteful lines through all the years that have marked success where gaseous firing has been in operation. By introducing one or two furnaces at a time, the whole carbonizing plant of such works as this paper more particularly refers to might, during the period which the figures cover, have been rebuilt, and great saving effected.

It has been said often enough that figures may be made to prove anything, and it has been said often enough, too, that the only advantage to be gained by regenerative settings is the saving of fuel—that equally high yields of gas can be obtained from direct-fired settings. But even if the latter assertion were true (which, however, the foregoing figures do not bear out), the saving in fuel is so considerable as to justify on most works, for that reason alone, the expenditure required for the better systems now on the market. Regarding the frequently-made statement as to the yield of gas, my best way of dealing with it will be to give you, not a fancy story, but evidence of something tangible in the way of results.

The Chelmsford Gas Company, in 1892, carbonized 3400 tons of coal, and produced 32,709,000 cubic feet of gas—giving a yield per ton of 9647 cubic feet, direct-fired settings being in use. Regenerative settings were added during the years intervening up to 1898. In the year 1900, 4046 tons of coal were carbonized, yielding 42,586,000 cubic feet of gas, or an average of 10,524 cubic feet per ton. For the three years ending 1900, an average yield of 10,609 cubic feet was obtained; the same class of coal being used in the latter years as in 1892. When it is remembered that coal costs something like 22s. per ton delivered into our works, this greater yield of gas becomes a most important matter.

The saving in coke, too, has also been considerable. Whereas in 1892 only 6·6 cwt. per ton of coal carbonized were available for sale, 9·4 cwt. were actually sold in 1900. The increased quantity of coke for sale during the latter year, when prices were high—reaching at one time 28s. per ton on the works—is a matter of great satisfaction, and a source of pleasure that the "old order" should have been at least partially "changed;" for it may be explained that a direct-fired setting had been in operation during a portion of the latter year.

Looked at from the more practical "£ s. d." standpoint, we shall see what this has enabled us to do. In a works heavily capitalized, it enabled the company to reduce its price of gas, and in face of the great advance in the price of coal to maintain its price to the consumers at the reduced rate, and thereby hold its own in the competition with other illuminants. It has also, during the last few years, enabled the shareholders to divide from 2 to 3 per cent. more dividend. All this is due, undoubtedly, to the improved methods of carbonization.

But apart from these monetary considerations, there are others of some moment which deserve attention. A really efficient regenerative retort-setting works with greater regularity in the matter of temperature than the old system; the charging of the producer being done at longer intervals favouring this. Then, again, the rapidity by which the heats may be raised should an extra demand for gas suddenly arise, the feeling of security engendered thereby, and the general order of tidiness which usually prevails in the retort-house, all tend to greater comfort in working and to make the life of the manager of small and medium-sized works pleasanter. And who would begrudge him taking advantage of such a state of things?

In a paper like this, it would be invidious to single out any particular setting for recommendation; several of them have their own peculiar or special features and superiorities over others. But I trust it may be within the bounds of propriety to mention one of the last and improved settings introduced into the Chelmsford works as an example of one of the advantages not only to the Company, but to the workmen employed also. This particular furnace was adopted on the patentee's word that it would be under absolute control and would not require clinkering. It has now been in use, off and on, for a period of three years; and during the whole of that time only once, I am assured by the man in charge, has it been necessary to use a clinkering bar. That occurred on an occasion when the steam supply to the grate-bars of the furnace had inadvertently been shut off for a shift or so.

The furnace is cleaned about every three days, and the process of cleaning consists in raking out a fine, friable ash; the whole operation being completed in a very few minutes. Between the periods of cleaning, little, if any, attention, beyond replenishing with hot coke every four or five hours, is required by the furnace. Compare this with the cleaning and laborious clinkering of the direct-fired systems, clinkering which requires to be carried out every twelve (and in some cases every eight) hours, in order that the heat may be kept up. Think what this means in waste of fuel, loss of gas consequent on the lowering of the heats during the operation, and wear and tear both of materials and muscle; and tell me if you do not think that the improvement in the condition of things all round is great, and worth all the time and money that have been expended to bring it about. But there can be no two opinions. Yet there is another tale to tell.

I have tried to show, and to prove, that there has been all-round improvement. Not only have many gas undertakings taken up the better methods of complete regenerator settings, but many other companies conducted by able, persevering, and zealous managers, have done something in the general advance. These men, determined on having the half loaf where the whole one was not obtainable, have set their wits to work, and have devised either generator, simpler forms of regerator furnaces, or have so altered and improved (by better proportioned furnaces and flues) the direct-fired settings as to yield much better results.

A word or two as to what experience has taught us should be the leading features of an ideal regenerative setting of to-day. It should be capable of perfect control. This can only be attained by having an ample producer provided with carefully-devised means for regulating the primary and secondary air supplies. The regenerator flues should be so constructed as to preclude the possibility of "bye-passing" or "short-circuiting." It is important that it should be so arranged as to give easy access to all flues for cleansing. It should be charged with hot coke. It should be capable of being worked with a maximum consumption of 17 or 18 per cent. of the coke made. It should aim at working as far as possible automatically, thereby requiring as little supervision from the manager as possible. The clinkering operation should be carried on with as little discomfort to the men as possible. And a really good regenerative setting—complete with all brick and ironwork, retorts, and labour included—should not cost more than £35* (more or less, according to locality) per mouthpiece.

It is difficult to conclude this paper without further reference to the annual returns; and I crave your attention to the following: There are shown in the returns last issued 60 works ranging from 12 to over 100 million cubic feet per annum capacity, carbonizing an aggregate of 281,141 tons of coal, and producing 2,556,949,000 cubic feet of gas per annum, the average yield of which per ton amounts only to 9094 cubic feet. There are many smaller and some larger ones not included in the list doing no better. It is not unreasonable to suppose that in most, if not in all, cases the fuel consumption for carbonizing purposes in these works is high. Think of it, in these days of high-priced coal, and you will agree with me that there is further demand for improvement. This is the worst side of the story, told in as few words as possible; and, what is more, and which gives point to the attention I have drawn to small and medium-sized works, some of the undertakings included in the above list, the totals only of which are given, are situated in East Anglia.

Discussion.

Mr. J. T. Jolliffe (Ipswich) asked Mr. Carpenter if he could give the details of the working of his retort-charging apparatus, so that the members could, at their leisure, work out how he managed to carbonize coal at a cost per ton of about 1s. 6d. to 1s. 8d. He asked this because they were favoured by the President (Mr. Brown) a year or two since with a paper in which he gave the working of his inclined retorts at the Cambridge Gas-Works. It was highly desirable that the Association should know, in the case of medium-sized and small works, on which side the advantage balance lay—viz., in the adoption of mechanical chargers or inclined retorts. If Mr. Carpenter could give the members this information, he (Mr. Jolliffe) at all events would be pleased.

Mr. J. Barton (Peterborough) said, so far as Mr. Carpenter's paper was concerned, he had had no experience whatever of hauling machinery. It seemed to him, however, to be a very useful paper and an interesting one; and it contained a good deal of information which would be of value to those engineers who were thinking of adopting plant of this description where the coal was conveyed by water. With regard to Mr. Smith's paper, he quite agreed with him that regenerative furnaces were a good

* Mr. Smith remarked that perhaps he would be nearer the mark if he said £32.

thing for all sized gas-works—whether small or large. He might say that he had had some little experience with regenerator settings, or semi-regenerator settings. He had introduced them into two works. In the case of one, they had been in operation three or four years, and had given very satisfactory results. The installation consisted of three beds of retorts—a bed of two, a bed of three, and a bed of four; so that, as the members would imagine, they were very small works. They only carbonized 500 or 600 tons a year. However, their experience was that there was a considerable saving in the quantity of coke used; and they had been able to maintain a dividend of 3 or 4 per cent. In the other works, he introduced the settings eighteen months ago. They also had done well. The make of gas ran up from 9000 to over 10,000 cubic feet, without an exhauster. A good coal was used; and there also had been a great saving in fuel. He could not give the exact figures, because it was rather difficult to get them from small works, particularly where there was no station meter. However, he was satisfied that it was the correct thing to do, where anyone was thinking of altering his system of carbonization, to go in for semi-regenerators where the full regenerator setting could not be adopted.

Mr. H. Wimhurst (Sleaford) said, like the previous speaker, he had had no experience of conveying plant; but, with Mr. Smith, he had had considerable experience with regenerator settings. When laying out his new works at Sleaford some six years ago, he determined then to go in for the best system that he knew of. They adopted regenerative firing. Some of the members had seen the settings. During the whole of the period they had been at work, they had given unbounded satisfaction. He went one better than his friend, Mr. Smith, in his results. Taking the figures of last year, he found that they made 10,968 cubic feet of gas per ton of coal carbonized; and they sold 10,139 cubic feet. The actual sales of coke per ton of coal carbonized (which he thought was the fairest way of taking the results of the fuel used) were 10 cwt. 1 qr. 12 lbs. During the winter months, a great quantity of their sale of coke was machine broken and local. He should say nearly 20 per cent. of their coke on the year's working was broken; and therefore they would lose about $1\frac{1}{2}$ cwt. of ash in breaking a ton of coke. The system had been so satisfactory in their case that, during last year (which was a bad one, as they all well knew, for gas undertakings), they managed to squeeze out $1\frac{1}{2}$ per cent. extra dividend, £500 was handed over to the reserve, and £497 was carried forward to the next account. This showed that the regenerative system, to which they owed so much of their position to-day, paid even in small works such as he came from.

Mr. J. Carter (Lincoln) said he thought he could suggest a method by which a more ready, and probably more interesting, discussion could be ensured upon these papers. He remembered—he thought it was about two years ago—when they were treated to an innovation in their methods in this respect. A paper of which he had very lively recollections indeed was distributed among a certain number of the members a day or two before the meeting; and they were then prepared to discuss the paper very fully. Was it possible they could do this when they came into a meeting as on this occasion, and simply heard the papers read, without having any anterior knowledge regarding them? He himself happened to be the victim on the occasion to which he referred; and it struck him that, if a few of them had had an opportunity of perusing the present papers during the previous forty-eight hours, it would have tended to a more thorough discussion than could possibly be expected under present circumstances. With regard to Mr. Carpenter's paper, he was quite sure it would add to the reasons that already urged a good many of them to consider the best means of handling their material in the retort-house and on to the coke-floor or yard. He did not wonder that a gentleman who was so interested in the success of his Company as Mr. Carpenter was, should, when facing the fact that his coal cost him something like 20d. per ton to get into his stores, look around for some more inexpensive method of handling it. The results they had in the paper were to a large extent local to Yarmouth—were peculiar to the circumstances under which Mr. Carpenter was working; but it was only a very commonplace remark to say that the whole question itself had possibilities with regard to most of them, and possibilities which they would do well to consider and apply in the future conduct of their undertakings. As to Mr. Smith's paper, one prominent result of the improvements which had been introduced at Chelmsford struck him very forcibly indeed. They could accomplish a good deal by improved methods, by more efficient plant, and possibly by more careful supervision; but this was the first time he had heard that by these means they could succeed in driving a coach-and-four through an Act of Parliament. Presumably that Act of Parliament did not apply in Chelmsford. To many of them, the Gas-Works Clauses Act would be an effectual barrier to putting 3 or 4 per cent. on the dividend as the result of the working of regenerative settings. No member would question the direct advantages that had accrued in their carbonizing returns from the introduction of gaseous firing; but he was not quite sure whether the author of the paper had, after all, done full justice to those who, in earlier days of working, were doing their best to not only produce the most efficient results, but were doing their best to serve the interests of the public. One fact which stood out very prominently, and which was difficult to account for, was the fact that the public interests had been the best served in two or three cases in the country by works using entirely direct-fired settings. How were they to account for the fact that the cheapest gas had been sold in towns where this antiquated (as they were justly entitled to call it) system of carbonizing was in force? Gas had been sold at 1s. 10d. per 1000 cubic feet (they had one conspicuous place where it was sold below that figure) in several important towns, among them a town to which one of their friends [Mr. John Young] was going, where it was sold at 1s. 10d. per 1000 cubic feet, he thought he might say, even before regenerative settings were largely applied to the carbonization of coal. They had, then, the broad fact staring them in the face that, with direct-fired settings, these good results were possible, and a creditable position at any rate had been maintained by the concerns to which he referred with regard to their responsibilities to the public. He did not know that, even with the improved methods of carbonization, they had been able to do very much more or better in the interests of the gas consumers than in those two or three cases that he had in mind. Figures, as Mr. Smith said, could be made to prove anything; it depended upon the skill of the manipulator as to the moral they were to draw from them. But he did think it was possible, as regarded the yield of gas per ton of coal, they could get as good results from direct-fired settings as from regenerative settings. It was, he believed, being proved every day; and the great advantages which they admitted did accrue from the use of the more modern style of settings were to be met with in other directions. The saving in the fuel account alone would pay for the additional expense of going deeper down with their furnaces; and the more perfect and complete control of the heat of the settings was an advantage which, under some circumstances, it was impossible to over-estimate. These were to a large extent commonplaces. But they all agreed that regenerative settings, and regenerative settings alone, would place gas-makers abreast of the movement of the days in which they lived. Even in small works, it had been recently proved that these settings were as applicable and as advantageous as they were, proportionately, in larger works. But while they rejoiced in the improved results to which Mr. Smith had alluded in his paper, he (Mr. Carter) did not think they had yet done the best they could do for their undertakings and in the interests of their constituents.

Mr. S. W. Durkin (Southampton), invited by the President, said he had had no practical experience in some of the topics alluded to in the papers, except perhaps the mode of conveying coal from the waterside into the stores. Some years ago it cost in his case about 2s. 3d. per ton, inclusive of trimming, to get the coal from their wharf into the Company's stores. Then, again, the labour troubles which existed in those early days caused this amount to go up by leaps and bounds; and it therefore behoved them to see whether something could not be done to reduce the cost of getting the coal into the works. Eventually £10,000 was laid out in plant; but they had to arrange with the Local Authorities, as a public road intervened between the wharf and the works. The Local Authorities wanted to impose some difficulties in the agreement that was to be entered into. They said a drawbridge would have to be erected; and this bridge would have to be drawn on one side to allow the traffic to go by, and, in case of notice being given to the works, the bridge would have to be rolled back on its wheels into the store. They wanted to impose on the Company some very severe conditions; and the whole thing fell through for a time. But wiser counsels prevailed; and the Local Authorities were settled with. Although they could not give the Company any legal powers, they agreed not to raise any objections. The work was proceeded with. Steam-cranes were erected; and these reduced the cost of conveying coal from the wharf to the works from 2s. 3d. per ton down to 7d. Labour troubles, however, had pursued the Company; and the cost had since gone up considerably. But it was a fact that, although the price was more now than was formerly paid under the new conditions, there was great economy in the working of the concern. He had had no practical experience of regenerator settings. They had at his works simply direct firing; and until the coal troubles of last year, they were selling gas at 2s. 6d. per 1000 cubic feet in the borough and 3s. outside. He might say they had always been fortunate in getting a good price for their coke. But now there were other people who imported coke into the district; and the Company were obliged to meet the competition by lowering the price of their coke. Beyond this, although a very old-established Company, their capital was rather heavy; but they had managed to go on very prosperously, and he hoped, as coals were somewhat reduced in price, to get back to somewhat like the former order of things. They had no coal conveyors or anything of that sort. They had to take local circumstances into consideration. Unfortunately, their works were very large, but were situated on a very small space of land for their size; and the plant had been distributed to meet the condition of things, so that the erection of all these modern appliances would mean an enormous outlay for the Company. Therefore they were going on the old lines at present; but when the works were extended again (which would not be very long possibly), something might be done in the way of introducing new methods into their working.

Mr. T. Glover (Norwich) remarked that he was much interested in both the papers, having had some little experience in the subjects dealt with. He very much appreciated Mr. Carpenter's paper and the improvements he had brought about in reducing the cost per ton of coal from the ship to the works. One of the great disadvantages of eastern or southern works was that coal

had to be seaborne, or very heavy freightage paid for land carriage; so that every effort should be made to reduce the cost from the coast to the works. He noticed Mr. Carpenter had reduced his cost from 20¾d. per ton to 10⅝d. At the works the charge of which he was relinquishing [West Bromwich], it cost them ¾d. per ton to unload the trucks into the coal hoppers or breakers, or about 1d. per ton from the time the trucks were delivered into the sidings, and the coal discharged and put into the elevators. This showed the great disadvantage of the cost for seaborne coal. With regard to the machinery Mr. Carpenter had adopted, it was a remarkable thing to hear of compressed-air being put into works carbonizing from 15,000 to 16,000 tons a year. But the author had given reasons for his choice; and he (Mr. Glover) had no doubt they were very good reasons indeed. In his experience with works carbonizing nearly 30,000 tons a year, with manual machines, the cost per ton for stoking alone—that was to say, retort-house labour, clinkering, elevating coal, and wheeling out coke—came to about 1s. 8d. per ton. Of this 1s. 8d., 3¼d. was due to the wheeling out of the coke; so that, if a coke-conveyor similar to the one shown on the diagram could be applied, the 1s. 8d. would be pulled down to about 1s. 4¾d., which was a very low figure. But there was one thing they all had to remember in applying machinery, or choosing any form of retort-setting, and that was the interest on capital and the wear and tear. If he (Mr. Glover) had adopted coke-conveyors, then the 3¼d. would not represent the saving, because there would be the interest and depreciation, which must be charged at a high rate on machinery of this character. When they had before them the subject of putting in conveyors some years ago, he found there would be a slight saving, but a great deal would be absorbed by capital charges. He could quite understand the retort-house work was well done at Yarmouth with this machinery; but Mr. Carpenter did not tell them whether he had applied regenerative or generator settings to his retorts. If not, he (Mr. Glover) had no doubt this would be the next accessory to the house. This brought him to Mr. Smith's paper. It was a remarkable thing that Mr. Smith told them, about a furnace not needing clinkering. But he (Mr. Glover) supposed, although it was not called clinkering, it was very much like it. The cleaning out of furnaces meant what some of them called clinkering. It was very much a question of terms as to what was clinkering and what was cleaning. The members must all know that clinkering depended upon the quality of the coal being carbonized. That which contained 4 per cent. of ash would cause much less clinkering than one that contained 6 or 8 per cent. There was the nature of the ash, too, as to whether it fluxed and caused hard clinker, and was friable by the application of steam. When hard clinker was formed on the brickwork of the furnace, there was nothing else for it but to apply false bars, and withdraw the ordinary fire-bars. They knew that a great deal depended upon the area—the bar area of the furnace. It was very inadvisable that a furnace should be at all contracted. The fire area should be laid so that the primary air did not rush through the furnace, and cause a cutting heat round about the bars. He noticed Mr. Smith quoted £35 per mouthpiece for a complete regenerative system; but he did not give details as to what this price included. He said: "A really good regenerative setting, complete with all brick and iron work, retorts, labour, all included, should not cost more than £35;" and then he added (in parenthesis) perhaps £32 would be nearer the mark. Did this include ascension-pipes, foul mains, hydraulic mains, and such fittings? [Mr. SMITH: Yes.] Well, then, that was a low figure; he thought much lower than many of them had found in practice. His (Mr. Glover's) experience was that a really good regenerative furnace, with all these fittings, making the floor good, and such like, cost nearer £40 per mouthpiece. But simple generator furnaces, bringing about the same results, with a slightly increased fuel consumption, could be constructed at a much lower figure. This was a matter for consideration for those who had not too much money to spend, and yet wanted the advantages of gaseous firing. It could be done at a lower figure even than that mentioned in the paper; but the fuel would not be reduced to the lowest figure. He (Mr. Glover) saw Mr. Smith's work a long time before he came South; and he knew he was doing very good work up in the north-west corner of England—in Cumberland. He saw Mr. Smith's regenerative settings there; and they were very good indeed. Therefore he could quite understand that Mr. Smith had, by following the same practice, been able to increase his make of gas per ton of coal from something below 10,000 cubic feet to 10,600 cubic feet. His own experience was that this could certainly be done. At West Bromwich, for a number of years, the make had been over 11,000 feet per ton. But the make in any case depended on the quality of the coal as well as the way it was handled; but whatever quality of coal they had, if they did not handle it right, it was impossible to get the full results from it. And as to the coke sold, they ought not to be content with less than 10 cwt. per ton of coal. It was possible with the best coal, and this method of working, that they could sell nearly 10¼ cwt.

Mr. T. A. GUYATT (Ely) said he observed that Mr. Carpenter had gone in for both hydraulic power and compressed air; and he asked whether he could not have made one system do for both purposes.

The PRESIDENT said they had had a very interesting discussion, and many excellent points had been brought out which would be useful. Mr. Carpenter in his paper, told them that his carbonizing cost 1s. 6d. to 1s. 8d. per ton against 2s. 6d. by hand. He was thus evidently doing very well by hand work before he took up the cause of machinery; so that his saving did not come out to so much as in the case of others. For instance, at Cambridge their cost was previously a little more than 3s.; but with inclined retorts—five beds only—they had reduced this down to 1s. 6d. As they were now going further with the system, and constructing another five beds in the same house, they would, he had no doubt, further reduce the cost, as they would be able to work the ten beds cheaper than the five. Then when they could get the hot-coke conveyor in, the cost would be still further reduced. Mr. Carpenter told them why he put in the power machines. It seemed rather an extraordinary thing to him (the President) that works of that size should have gone in for power machines. He had always understood that with power machines, twenty beds at least were required to get full work out of the machines, so as to repay those who adopted them for the capital outlay. But Mr. Carpenter—from what he (the President) could see in the drawings—had only twelve beds for the power stoking machinery; and he presumed that only a small portion of them was working during the major part of the year. There was no doubt—in fact, Mr. Carpenter said so—that it was owing to the peculiar circumstances of the situation that he was forced, so to speak, into this system. He (the President) would like a little information with regard to the cost of the installation. There did not seem to be anything in the paper as to the cost; and that would be interesting, especially to those who were favourably inclined towards sloping retorts as compared with stoking machinery. Coming now to Mr. Smith's paper, there could be no two opinions about what they should do in regard to the regenerative system as compared with the direct-fired system. They should certainly whenever they had the opportunity (he did not say they should pull out settings that were doing good work on the direct-fired system) go in for regenerative furnaces. Mr. Smith told them that sometimes it was said that the only advantage to be gained by regenerative settings was the saving in fuel. This was only a small matter when they considered the other advantages. With the even heating throughout the settings, they did not get the same wear and tear on them as from direct-fired ones; and therefore the life of the retorts was considerably longer than with the direct-fired system. With regard to the fuel consumption, of course in small works it was found to be a great deal higher than in works such as most of the members had charge of. When he first went to Cambridge, the fuel consumption almost took his breath away. In looking into the matter, he found it was something like 35 per cent. He thought this was one reason that immediately decided him that regenerative furnaces were the right things. The retorts were small; and the settings were on the horizontal system with direct fires of an antiquated description. This was the reason they went away from hand labour and direct firing to inclined retorts and regenerative furnaces.

Mr. CARPENTER, in reply to the remarks on his paper, said Mr. Jolliffe asked him for more details with regard to the working at Yarmouth. He might in answer give one instance. They had now a pretty regular gas-making figure; and they did most of their work with twelve settings. By hand work, they employed eighteen men with these twelve settings; and they could not do with less. Now they only employed twelve men, and made considerably more gas per retort. So that anyone who adopted the system could soon make a big reduction as had been done in his case. The figure he had given was a comparative one; but it was not one that everybody could adopt. It included the removal of the coke; but as the coke yard was next to the retort-house, the coke was taken away pretty freely. However, the number of men was greater than if they had not to take the coke out. Regarding Mr. Glover's remark about the settings, he (Mr. Carpenter) would like to have regenerative settings; but he had done very well with direct-fired ones. The only difficulty he had in the works now was to keep down the make per mouthpiece. He found they were safe enough in making a certain quantity of gas per mouthpiece; but they were not safe in going beyond it. They made up to 7000 cubic feet per mouthpiece comfortably; but beyond this there was difficulty with the mains. They had less difficulty with 6700, 6800, or 6900 cubic feet than they had with (say) 7500 cubic feet. They got excellent results with direct firing. If they wished to put in regenerative furnaces, they would have to raise the roof of the house, as the circumstances in Yarmouth were such that, if they went down, they soon got to water. Respecting Mr. Brown's remarks as to the cost of putting the machinery in, it must be remembered that they had the short-hour question looming in the distance; and if the old circumstances had continued, and they had not given way, they would have been "bottled up" in the hottest weather. Supposing they wanted 25 stokers, he did not know where they would get them in Yarmouth. The men preferred the sea-front in the summer, and they took advantage of it. This being the case, the Company had to protect themselves; and so they spent £4500 to £5000 on the installation he had described, and in this way they had thwarted the short-hour movement, which would have cost the Company £700 or more per annum. They also suffered from the fact that the London Gas Companies gave their men a week's holiday; and these men found their way to Yarmouth in large numbers. Somehow or other they got nice blue serge suits and brown boots; and they seemed to think, when they arrived at Yarmouth, the best thing they could do was to go to the gas-works and describe to the Company's men the excellence of the holiday system in London. This rather had the effect of unsettling the men. Having this

and the other points he had mentioned to deal with, the Company had to embark upon the expenditure named in order, as he said, to protect themselves, and to make things fairly comfortable.

Mr. SMITH said there was not much for him to reply to. In the first place, regarding the remarks of Mr. Barton, he appeared to have seen the advantages of gaseous firing even down to very small works. He was extremely glad to hear Mr. Barton's testimony on this point. He (Mr. Smith) was also interested in several small works; and he had often wondered how far they could go down in the application of regenerative retort-settings. As to Mr. Wimhurst's observations, he told him (Mr. Smith) that he could go one better than they did at Chelmsford. In answer to this, he might say that they used direct-fired settings on part of their works; and this affected the results. Then they used a small coal, and also an unscreened, north-country coal, which could not be relied upon to give 10,968 cubic feet of gas per ton, and would not, he ventured to say, in Mr. Wimhurst's works. The results depended very largely, as Mr. Glover told them, upon the quality of the coal—not only in regard to the yield of gas, but the coke sold as well. At Chelmsford they used coke for their boilers, for the sulphate of ammonia plant, and for other purposes on the works, and they also used it in the direct-fired settings. But though, under the circumstances, he considered 9·4 cwt. of coke sold per ton of coal was good as compared with the sales some six or eight years ago (before the introduction of the regenerative settings), he was not altogether satisfied. He hoped to see the figure raised to 10 cwt. He had not laid before the members a fancy picture, but a straightforward record of results at Chelmsford. Mr. Carter wondered whether they were driving a coach-and-four through their Act of Parliament. He could assure Mr. Carter they were not doing anything of the kind. Some years ago they did not pay their full statutory dividend; and they had now increased it from 6 to 9 per cent. He quite agreed with Mr. Carter that the early workers did a great deal of good. It was probably due to the best of them that regenerative settings were introduced, and that different and better forms of settings were afterwards gradually adopted, and helped to improve the results all round. There might be, in the case of the works Mr. Carter referred to—where they were selling gas at 1s. 10d., 2s., and 2s. 6d. per 1000 cubic feet—some specially favourable conditions which enabled them to manufacture cheaper, or maybe the capital account was lower than in other undertakings. At Chelmsford, with their lowest sales of gas in the last twelve years—say, 28 million cubic feet—the capital account was about £35,000. On the other hand, he had in mind a small works in the North of England selling about 26 millions per annum, at 2s. 6d. per 1000 cubic feet, with a capital of between £2000 and £3000. In such a case, one need not wonder at the price of gas being low. He was a little surprised that Mr. Glover should ask the difference between what was described in the paper as the removal of the ash from the particular furnace he had described and clinkering pure and simple. He (Mr. Smith) had a good idea of what using the heavy clinkering-bar meant, and particularly when it had to be used in a regenerative setting. He thought Mr. Glover "played low" when he pretended not to know the difference between clinkering a regenerative setting with a hard fluxing coal (probably containing a lot of sulphur and a high percentage of ash), and a setting in which clinker was not formed as in the case of which he (Mr. Smith) spoke. They had other regenerative furnaces besides this particular one, all of which required a considerable amount of hard hammering to clinker them. But he could assure the members that the cleaning of the one to which he had alluded was a very simple matter indeed. There were no fire-bars in the four furnaces he had mentioned, but there were in the one which he said did not require the clinkering-bar. As to the saving of fuel not being of so much importance as the wear and tear of the retorts, he could not agree with the President. The saving of fuel, as proved by the figures he (Mr. Smith) had given, and as many of the members could bear out, was very considerable, and was far greater than the wear and tear. He did not see why a consumption of 35 per cent. of fuel should have taken away the breath of the President, considering that when he (the President) went to Cambridge none but direct-fired settings were in use. He (Mr. Smith) could say he had not seen many direct-fired settings with a lower consumption of fuel than 35 per cent. of the coke made.

Mr. ALEX. MITCHELL (Bury St. Edmunds) said he had to propose a very hearty vote of thanks to the authors of the papers, which were on subjects of the greatest interest to the members. Mr. Carpenter's paper on the question of "Machinery v. Hand Labour" appealed to everyone, especially to those in the larger gas-works, and those in towns where labour was a disagreeable point to take up. Then Mr. Smith's paper on the general subject of the improvement of carbonizing could not fail to interest everyone. They were pleased to think that there were some of their members occupying positions in which they could carry out not only experiments, but obtain actual experience with such things as labour-saving machinery and the best systems of carbonizing. However, those of them who were managers of small works need not lose heart altogether, because, although they were not using regenerative furnaces, many of them could easily get as high as 10,600 cubic feet of gas with their direct-acting furnaces; but, of course, if they could have regenerative or generator furnaces, they could save a quantity of coke. But no one need think he could not get 10,600 cubic feet with a first-class coal by giving proper attention to the retort-house. If anyone in the Eastern Counties used an inferior coal, he made a huge mistake, on account of the long railway carriage that had to be paid.

Mr. W. D. CHILD (Romford), in seconding, said that at the commencement of the discussion, the President invited him to join in it; but he felt strongly the point urged by Mr. Carter, that two such papers as they had had the opportunity of listening to that day demanded more time for the preparation of comment than one had by simply listening to the reading of them. He would therefore suggest to the Secretary that, if he was again fortunate enough to secure two such valuable papers as he had brought before them that day, some steps should be taken to issue them a day or two in advance of the meeting, so that they might be fully considered. Having a complete knowledge of the circumstances of Mr. Carpenter's surroundings, he could congratulate him on the very happy combination of machinery and horse traction which had enabled him to deal with his coal at a cheaper rate, and which would place him in a comparatively comfortable position in times of emergency. With regard to Mr. Smith's paper, he was a little doubtful whether he had not given too much credit to gaseous firing for the increase in the quantity of gas he had been able to obtain per ton of coal, and had left unnoticed what was due to his personal acquaintance with the coa he was manipulating, and the close personal supervision that he exercised. He (Mr. Child) believed gaseous firing could do a great deal for them; but he did not think it was to be credited with all the increase in the quantity of coke obtained per ton of coal carbonized that Mr. Smith had named. He would certainly be justified in taking some of the credit to himself.

A brief acknowledgment was made by both Mr. CARPENTER and Mr. SMITH.

PLACE OF SPRING MEETING.

Mr. WIMHURST moved that the next meeting be held at Boston. He was sorry Mr. Dougall was not present that day to propose this himself. But having had a conversation with him some time ago, he (the speaker) knew that he would be glad to receive the Association at Boston next April, and accord the members a very hearty welcome.

Mr. J. G. HAWKINS (Spalding) seconded the motion, which was unanimously carried.

This concluded the business portion of the meeting.

VISIT TO THE GAS-WORKS.

Brakes were in waiting outside the Guildhall for the conveyance of the members to the gas-works. A photographic record of the visit was first secured. Then the party rambled through the works, paying special attention to the new work which has been carried out since they were there in April, 1899. They found a new installation of condensers on Messrs. Cutler and Sons' principle now in existence; and a new engine-house and engines and exhausters, by Messrs. Bryan Donkin and Clench, Limited. But the largest work has been the completion of the raising of the retort-house walls and roof; and now the New Conveyor Company's men are busily employed in finishing the equipment of the house on the inclined system by constructing five more beds of sixes, which represent half the capacity of the building. Coal elevating and conveying plant for the whole ten beds, with a coke-conveyor will make the furnishing of the house complete and as automatic as it is possible for it to be. Time does not alter Mr. Brown's opinions as to the efficiency of his inclined settings; and he speaks as highly of them now as he did when he read a paper on the subject before the Association last year. Improvements in other directions are also in contemplation.

DINNER.

In the evening the members, with a number of friends, dined at the Lion Hotel. A very enjoyable time was spent. Among the local gentlemen present were Alderman Stace, Mr. A. E. King (Secretary of the Gas Company), Mr. W. W. Gray (Engineer of the Water Company), Mr. A. E. Edwards, and Mr. H. D. Catling. In the course of the after-proceedings, the kindness of the Mayor and Corporation in granting the use of the Guildhall for the meeting was duly acknowledged.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Forty-ninth Half-Yearly Meeting of the Association was held at Ripon on Saturday; and that the selection of this city by the Committee met with the approval of the members—notwithstanding that it involved a long railway journey for the majority—was evidenced by the gratifying attendance. And those who were present were amply rewarded—not only so far as the main business of the day was concerned (the hearing of the Presidential Address of Mr. Matt. Dunn, of Goole), but also by the exceedingly pleasant afternoon spent in visiting Fountains Abbey.

On the arrival of the members and a few invited guests at the station, about mid-day, conveyances were found waiting to take the party to the gas-works, where they were most hospitably received by Mr. E. E. J. Anderson (the Engineer and Manager of the Corporation Gas and Water Department) and his wife to

light refreshments before inspecting the works. Here everything was found in admirable order, but, of course, little changed from the time of the visit of the Manchester District Institution of Gas Engineers, so recently as August last year, when a description of the plant appeared in the "JOURNAL"—see Vol. LXXVI., p. 524. It is needless therefore to repeat the particulars then given.

A further short drive conveyed the party to the Crown Hotel, in the Market Square, when the formal business of the day was transacted. Mr. DUNN having taken the chair,

The HONORARY SECRETARY (Mr. J. H. Penney, of South Shields) read the notice convening the meeting, and referred to a number of letters he had received from members not able to be present—among them, one from Mr. Charles Sellers, of York, who is just now confined to his house by sickness.

On the motion of Mr. E. H. MILLARD (Durham), seconded by Mr. JAMES WHYTE (Seaham Harbour), the following were elected to membership of the Association:—

Ordinary Members.—Mr. Norman Cox,* Sunderland; Mr. J. W. Finlayson, Masham; Mr. D. E. Garlick, Barnoldswick; Mr. M. Leaf, York; Mr. E. W. Lupton, Otley; Mr. R. M'Millan, Hessle; Mr. R. S. Tobey, Malton; Mr. F. E. M. Tooley, South Shields; Mr. G. L. Swallow, Elswick; Mr. J. W. Turner, Ravensthorpe.

Associates.—Mr. W. A. Bower, Normanton; Mr. O. H. Ingham, South Shields; Mr. C. Pattrick, London; Mr. W. F. Smithers, Stockton-on-Tees.

This large accession to the roll of the Association—making the total membership 176—was greeted with applause.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—On this, the first occasion that I occupy the chair of this important Association, to which you have so kindly elected me, I would like to express to you my deep sense of the honour you have done me, and my sincere thanks for the confidence you have reposed in me.

I take the chair of the Association at a very important period; it being the beginning of a new century—a century that takes over the immense wealth of the past. Science has advanced with rapid strides during the last century, which was one of great discoveries, great experiments, and great advances in the utilization of the world's forces and resources. The application of gas and electricity to the comfort and advancement of life have been perhaps its outstanding features. Both industries have made great progress during its closing years. The former has so far held the premier position in the illumination of our homes and streets; the latter being inaccessible to the masses, because of the hitherto expensive cost of production. Notwithstanding this, gas managers are faced with very powerful competition.

Before proceeding with the true subject of this address, it appears to me opportune to refer to the financial position and standing of the Association, the total membership of which now stands at 175, as compared with 80 in 1881, and 98 in 1891, which must be admitted to be exceptionally satisfactory. The financial position, too, is in a very prosperous condition, due in a great measure to our esteemed and beloved Mr. Hardie, whose death is yet deplored by all who knew him, to our present energetic and painstaking Secretary, and to the diligence of the Executive Committee.

There can be no doubt whatever that this Association has been in the past of eminent usefulness to the gas industry, which usefulness, I hope, will be still further enhanced in the future. But permit me to point out that true prosperity is only the outcome of intense interest taken in its affairs, not only by its officers, but by every member. I therefore draw your attention to the matter in the hope of inducing the members to advance to the line of usefulness by coming forward with papers on matters of importance, which, I need hardly assure them, will be highly appreciated from time to time by the Executive Committee in particular and the members generally. It is, indeed, a very difficult matter to select a subject upon which to dilate anent the gas industry, as almost every topic is being treated in such a lucid and explicit manner either by our gas lighting periodicals, or in the form of papers, lectures, and addresses.

On many of the most important points with which the gas profession is at the present moment confronted, it seems quite beyond my capacity to even attempt criticism, or add one suggestion likely to elucidate or further improve the reliable information which is being regularly acquired by this means from time to time. I intend, however, rather than attempt touching upon many questions, to confine my remarks to a few matters which, to my mind, are increasing in importance with the advancing times.

Coal Prices.—Since the last annual meeting, the gas industry has passed through a very critical time, in consequence of the extraordinary and most unfair advance in the price of coal and other materials, causing an almost universal advance to be made in the price of gas throughout the country. Very few companies were in a position to avoid advancing their charges; and it is very gratifying to note that even the few companies who deemed the advance unwise have, I believe, without exception, suffered very little indeed on the year's working—residual sales having, in some cases, more than compensated for the increased coal account.

* Transferred from the class of Associates.

It is very detrimental, and opposed to the progress of gas undertakings, to have recourse and occasion for advancing gas rentals; as, when resorted to, they generally result in a largely decreased consumption, and consequent losses thereby. There may have been but little excuse for the rushing-up of coal prices; but, on the other hand, it seems to me that there is no justification for companies or corporations disposing of their whole profits every year. A good reserve fund subscribed to in successful seasons, would be a wise prevention against such extraordinary circumstances.

Recent coal contracts have, however, been placed at a greatly reduced price—viz., at from 2s. 6d. to 4s. per ton in Yorkshire, which reduction will materially improve matters, and in many cases ease the troubled mind of the gas manager, council, or directorate, who may not have previously made such a wise provision. Under these improved conditions, it is hoped that gas companies will soon be able to again recoup themselves for any losses sustained in consequence of the demands of the colliery proprietors.

Coke Sales.—Much might be said with reference to the question of coke sales, and to the most fitting and opportune allusion to this question by Mr. Charles Wood in his presidential address to the Manchester and District Association of Gas Engineers. He wisely objected to the practice, which seems to be growing, of selling surplus coke outside the town at absurdly low rates; this practice, with high railway rates and cheap steamer carriage, proving hard upon companies or corporations situated near the sea, who might be trying to foster a local coke business. There is little doubt that a large quantity of coke sold to the foreign market at low prices finds its way back to this country.

It will be remembered that at the last meeting of this Association, held at Newcastle-on-Tyne in April, it was suggested that the issue of a monthly coke-list, containing the prices and stocks of the various works in the district, would be of advantage to the members. As the rules did not, however, admit of such a course, the matter was not entertained. After the meeting in question, the Committee suggested that it might be taken up outside the Association, but under their auspices and through the Hon. Secretary. Hence a circular was issued to managers of the principal works in the district asking them to contribute. Works producing a comparatively small quantity of coke were not circularized. Fifteen gas companies and local authorities having responded favourably, the first list was sent out in July last; and it has since been issued monthly. Mr. Penney supplies the circular free to those who contribute to it. The rules are that each contributor should, a few days before the close of each month, make a return of his highest and lowest price for coke at the works, and his price for shipment at the nearest port; also the quantity he has in stock, at the same time enclosing a stamped addressed envelope for the transmission of the list. The Committee are desirous of extending the usefulness of the list. They therefore regret that some of the larger companies have not yet consented to join. The list should be regarded as private and confidential—*i.e.*, its contents ought not to be allowed to transpire outside the circle of contributors.

The cutting of coke prices is doing much harm in many districts; and I would strongly suggest that managers in various districts should meet and discuss prices, and, if possible, prevent this cutting. In this, managers would need to be absolutely loyal and perfectly straightforward with each other, or it would render these meetings quite useless. With a perfect system and understanding, we should enjoy better prices, and derive many other benefits. Our societies are many, and have done admirable work in the dissemination of ideas and results, more especially with regard to the more technical side of our work. What I propose is a series of meetings in local centres, perhaps monthly, when the more commercial elements might be discussed.

Conveyors.—The Right Hon. Arthur J. Balfour, referring recently to the numerous Parliamentary Bills relating to social questions, jocularly remarked "We are all Socialists now." I may, with a far greater degree of accuracy. assert, we are now all advocates of automatic appliances; and several members of the Association were among the pioneers in the adoption of these useful devices to lessen the labour bill. Conveyors and elevators for coal are now the rule, and not the exception, in all medium and large size gas-works; and the improvement in the designs and construction have been so marked generally, within recent years, that further improvement can only occur in the veriest details, and no engineer and manager of a gas-works need hesitate to adopt these labour-saving appliances to deal automatically with coal.

Now that the appliances to manipulate the coal have been perfected, attention is being given in a very practical manner to conveyors for coke, particularly for the conveying of hot coke; but there appears to be considerable diversity of opinion as to the best form of conveyor to obviate breakage, and withstand wear. There are few materials so grinding and wearing in its action as coke when in contact with the working surfaces of machinery in motion. The attrition we all know is great, and many of the earlier types of conveyors, which did good work for many years in the automatic conveying of coal, when tried on coke, did not outlive the age of infancy; and the little that was left of these worn-out juveniles was quickly deposited on the scrap-heap. It will be pleasing to the members of the Association to be reminded that the first coke-conveyor erected in front of a bench of inclined retorts, was put there by one of our most esteemed members, Mr. Bower, of West Hartlepool. It is about

ten years since Mr. Bower installed conveyors; and in a letter addressed to the "JOURNAL OF GAS LIGHTING" in May, 1899, he informed us that this coke-conveyor had throughout all the years been in successful operation.

There appear to be three recognized designs of coke-conveyors—viz., "push-plates," "drag-bar," and "steel-plate belt;" all arranged to drag, trail, scrape on, or move in a trough. Their adoption has been, I believe, in the order in which I have named the various types; and the evolution appears to have been similar to the almost identical appliances tried from time to time in the conveying, cleaning, and loading of soft coal at our North of England collieries. Usually, the conveyor is of the "push-plate" or "push-bar" type, with special roller chains and slides to suit the exceedingly hard work such apparatus has to bear. The return is perhaps best carried on brackets above the mouth-pieces. These brackets may be made by extending the H-iron girders which are now frequently adopted as the tie-rods joining the buckstaves. It is not for me to indicate what type of coke-conveyor any of you should adopt; but I may remark, if history should repeat itself, we are likely to see the "push-plates" and "drag" types discarded, as has been the experience at collieries, for the carrying "plate-belt."

This type, arranged to run in a water-tight trough and immersed in water to prevent the "buckling" of the carrying plates, is not unlikely, in my opinion, to be largely adopted, as it appears to be a simple and strong form of conveyor, embodying the best points of the coal-picking belt, with additional new features to ensure for it a reasonably long life as a hot-coke conveyor. Messrs. Jonas Drake and Son have introduced a new type of conveyor, which comes from the Continent with a very good reputation, and which has been fitted up in a southern works. I have not been able to examine this installation; but it appears, from the drawing, to be of the "rocking" type, in which the material is shot forward by the action of a cam. It should be cheap to erect, and not very expensive in working. In allowing for wear and tear on such machinery, a high annual percentage should be given. It must be remembered that we are saving wear and tear on human beings, but at considerable cost in the matter of metals, which are so quickly acted upon by the grit and dust of coke.

The Gas of the Future.—The question arises, "Will coal gas take the lead in the future?" It depends entirely upon industry and enterprise, and the scientific development regarding its production. My humble opinion is that the age of coal gas is not over, although I feel quite sure many calls will be made upon the engineering skill of the profession to devise a means by which gas will be produced at a cheaper rate than the present methods will allow. By these remarks, I do not wish it to be thought that I am belittling the many improvements of recent times.

If the future of the gas industry is to be, as many believe, in the direction of heating and power, it would seem that the invention of Dr. Mond bids fair to be the one most likely to succeed, making as it does a gas of very even quality of the producer and water-gas type, with which we are familiar in the "Dowson" plant. It also shows great ingenuity on the part of the designer in utilizing the heat, not only for assisting in generating the steam, but also in using the cooling effect of this utilization for reducing the temperature of the water used for condensing the gases. The large yield of sulphate of ammonia will, it is to be feared, cause that already much-reduced-in-price commodity to fall still lower in the market when this apparatus gets into complete working order. It must be borne in mind, however, that this Mond gas, while it can be manufactured at a low price, is much below the heating value of ordinary coal gas; and therefore a far larger quantity is required to be employed to gain the necessary power. Again, the engines for using this gas must be specially made to take in only so much less air as will serve to cause complete combustion in the cylinder of the engine. At the same time, much larger engines will be made, and will work more economically than is the case with the steam-driven engines of the present day; and this will help to keep Britain where it is in the markets of the world by conserving its coal stock.

Enrichment.—Benzol enrichment seems to be finding new advocates daily; and while this commodity retains its present price, it is certainly a cheap, efficient, and handy carburettor. In combination with some such plant as the Dellwik-Fleischer, it may prove a means of keeping down the price of gas, and of reducing the quantity of coke for sale. The Dellwik-Fleischer apparatus aims at the economical production of water gas *per se;* and by the utilization of all the waste gases, this object is successfully attained. In carburetted water-gas plant, these waste gases are required for heating the carburettor and superheater for the successful gasification of the oil employed to render the water gas a light-giving one. The heat required to gasify the benzol is so small that it can readily be obtained from the ordinary steam boiler.

Carburetted water gas has been so much spoken of at various meetings lately, that little need be said here of the admirably designed plants erected by Messrs. Humphreys and Glasgow and the Economical Gas Apparatus Construction Company. Despite Mr. Porter's Gas Institute paper, this method of gas-making is being almost daily adopted in new works, or being added to in those where it is already in use. The gas engineers of this country are not likely to put down plant which is not of a paying nature in some form or another. These carburetted water-gas plants have furnished so many returns that the most accurate data are available. In fact, the contractors are quite willing to guarantee a certain result as to quantity and quality of gas made and the quantity of coke and oil to be used for a given result. These should satisfy the inquiring engineers as to its advantages. No doubt the rapid means of obtaining an increased quantity of gas of any required illuminating power will weigh with many, even if the cost is no less than with the ordinary coal-gas method.

Speaking of the system of making blue water gas and illuminating it with benzol, brings us to Professor Lewes's process of introducing blue water gas into the coal-gas retorts during the making of the ordinary coal gas. This is a process which must have a great fascination for all gas engineers, and one which certainly appears to have a number of chemical and practical points in its favour. Before, however, we can be sure of the full value of the process, a number of experiments must be carried out and equally accurate tests made, as those mentioned by Professor Lewes in his paper at the Engineering Conference at Glasgow. It will not only be necessary for us to know what the effect will be with various coals making gases of several illuminating powers, but also what quantity of blue water gas must be introduced into the coal-gas retorts, and at what time this must be inserted. Mr. Herring, of Edinburgh, has offered to place a portion of his works at the disposal of the Professor to try the process with Scotch coal; so we are sure to have, in the spring, exhaustive tests made on this subject, which will go far to help us to judge of the advantages with high quality coals. Unfortunately, the tests made at Sydenham do not answer the second question, which it would seem is a very important one.

We all know the great difference in the quality and composition of the gases made at different times during the distillation; and it will be necessary to very carefully regulate the quantity of blue gas entering the retort if we are to get an even and equal illuminating power. This evenness of illuminating power is one of the difficulties of the process, as when water gas and coal gas are stored together, they do not mix so very readily; and this is likely to prove troublesome when some 30 per cent. of blue water gas is present. Benzol will supply the illuminating power; but we have not yet an automatic apparatus which will supply the right quantity of benzol to the gas required to bring it to a fixed illuminating power. The trouble with carbonic acid will be heightened by this process, although this will not affect a great many gas managers who are not working under the sulphur clauses. Scotch coals contain a much larger percentage of carbonic acid; and the managers there find no difficulty in coping with the increased quantity.

Perhaps the greatest objection to this process will come from the users of the combined gases, as the holes for the admission of air into the bunsen burners—whether for heating in stoves or in incandescent burners—will have to be reduced, as the large quantity of blue water gas will require a smaller quantity of air for complete combustion. There is another point upon which we shall require further information; and that is in regard to the effect upon naphthalene. We know that carburetted water gas has no effect upon this troublesome hydrocarbon; and where carburetted water gas is used, the trouble continues as before its introduction. It will therefore be very interesting to see the further experiments with the process in this particular.

Coke-Ovens.—The last few years seem to have brought forward a number of new methods of producing the gas we all have to manufacture. Perhaps the latest is the coke-oven method of production. For years past many efforts have been made to increase the size of the retorts—it is feared, however, with but little success. The latest plan, which has been evolved from the old coke-oven style, wherein the gas was wasted or only used to heat the ovens, appears to mainly consist of a high, narrow channel or retort heated at the bottom and both sides by producer gases on the Siemens regenerative principle; the length of these being about the same as the ordinary through retorts, the width some 15 to 18 inches, and the depth from 6 to 7 feet. Such ovens or retorts would hold 5 to 8 tons of coal—a vast difference from the ordinary gas-retort charges. The time required for burning off this larger quantity is from 24 to 36 hours. The handling of such large quantities of materials must necessarily incur the use of mechanical means. This will result in a large saving in labour, and will of itself be an inducement to many to try the process. The coke made is also of a much higher quality than that turned out from coal-gas retorts, finding a ready sale for use in blast-furnaces at a considerably increased price. Coke must become in the future a much more generally used fuel for its smokelessness, if for nothing else. Unfortunately for us gas-makers, the yield of gas per ton of coal is not quite so good as in the case of the ordinary retorts; and this will be most against it from our point of view. The use of some of the gas made for heating the ovens is not, perhaps, according to our ideas. The addition of water or producer gas plants will, however, help this matter greatly; and, be it remembered, the gas used is only that produced at the latter end of the charge, and is therefore not nearly so valuable for lighting purposes.

About one-half of the total gas produced can be used for sale without enriching; and from the balance all the benzols are removed before the gas is employed in the furnaces, and this can be used to enrich any other gas which may be used as an auxiliary. In the best American practice, a water-gas plant is combined with the coke-oven apparatus, which can be carburetted either with the heavier oils or with benzol as required, or can be used as a machine for manufacturing producer gas for the heating of the ovens. This seems a very good arrangement, as the quantity

and quality of the gas made can be easily regulated by means of the various pieces of apparatus which will be making such a variety of different quality gases. The advantage of carbonizing such a large quantity of coal at one time is very great, as the plant for inserting it into the retort can be made very simple when worked by power. Again, the pushing out of the coke appears also a very simple matter, as the whole is driven out by a ram from the back end on to a sloping moving stage, where it is quenched, and then at once put into trucks or barges. The only trouble with the whole plant would appear to be that the varying quantities of gas required would necessitate the lighting up and letting down of these ovens fairly frequently; and this would necessarily vary the quantity of coke made. If the market for this coke were once made, it would be necessary to keep the supply up to the demand; and this could only be done at the expense of the gas—one or other must suffer.

Reading the accounts of the meetings at the Glasgow Engineering Conference, where Professor Lewes's paper preceded that by Dr. Schniewind, one is at once led to the thought, Why not combine these two ideas and put into the coke-ovens during ten or eleven hours of the charge a certain quantity of blue water gas, so as to have the benefit of the hydrocarbons, which the gas itself could not carry? This should have an equally good effect as in the ordinary coal gas retort; or it could be arranged to run the blue water gas in as already mentioned, then run for a few hours without water gas, and finally finish by running the last few hours for heating the ovens and recovering benzol.

There is yet another method of working which occurs to me. The make of poor gas during the last few hours of the charge in one oven could be passed through during the earlier portion of the burning off of the charge in another oven, and so gain an increased illuminating power over the whole of the gas made. Whatever system may be ultimately adopted, it would certainly seem probable that some modification of the coke-oven method will come into use in the future for gas-making purposes—if not in small works, then certainly in large ones, where the variations in gas wanted each day are great. Possibly the gases to be made for heating will for a time be made in a separate producer on the Siemens regenerative principle, by using some of the coke made for this purpose. Mr. C. C. Carpenter has been a great advocate of this system of separate producers, placed, if necessary, outside the retort-house, and in the coke-yard. He has not only advocated these, but has had the courage of his convictions, as shown by the arrangement at the Old Kent Road.

Truly, to design a new works at the present time requires a much larger amount of careful thought and an ability for far-seeing much greater than was necessary a few years ago. There are so many new processes and methods to be taken into consideration, and so many large and small points to be discussed, all of which may have many points of excellence but which may not prove advantageous in the particular locality where we may be situated, or suit the coals with which we have to deal. Gas-works are not nowadays, as in the past, all upon one model—the large ones merely an expansion of the small. There is a greater amount of individuality about the design, a larger difference in detail, and, let us hope, a more scientific and less "rule of thumb" method employed. Tests are now made and published from which almost any data can be deduced; and these tests are of a more complete nature than formerly obtained.

High-Pressure Gas v. Electricity.—Again referring to the rivalry of electricity for lighting purposes, it has for a time past been held by electricians that, for large open spaces, the arc system was without question the only one for success. In Paris, at the Exhibition last year, this was shown to be erroneous, as the intensified gas system was equally satisfactory, and far less costly. More recently the admirably successful installation at the Glasgow Exhibition has still further proved the contention. When we consider that the cost for gas for some 237,000 actual candles only amounts to some 16s. to 17s. per hour, with gas at 2s. 6d. per 1000 cubic feet, we at once see how impossible it is for electricity to compete at present figures. It is, perhaps, hardly necessary for me, in an assemblage of gas engineers, to point out the difference of the "candle" as understood by the purveyor of electric arc light and what I have called above the "actual candle." It has been the remark of all who have witnessed this installation, that the 1000-candle gas-lamps, obtained with only 31½ cubic feet of gas per hour at 8 inches pressure, were vastly superior in light giving power to the so-called 1000-candle power arc lamps in the same Exhibition grounds; while the colour has proved much pleasanter to the eye.

Whether this 8-inch or 9-inch pressure required for the high-pressure incandescent light should be obtained by means of separate motive power, as is done in the case of the Keith and also the Sugg process, where the pressure of the usual town's supply of water is utilized to give the necessary compressing power, or by the Scott-Snell lamp, in which the heat of the combustion causes the compression of the gas by means of what is to all intents and purposes a heat engine, is perhaps one of the questions of the present. But for the future there is no doubt we must face the question of supplying our gas at a higher pressure so as to obviate the necessity of any plant for accomplishing this object. Most works of any size could deliver gas at 8 or 9 inches pressure without any special plant; and surely we can lay our mains to carry this small pressure when the water-mains are constantly working with pressures of 40 to 60 lbs., which equals from 1100 to 1630 inches of pressure. If this is done, our mains will serve us for many years without increase of size, as at the increased pressure the volume capable of passing through them will be also increased, as double the pressure will give one-and-a-half times the delivery.

Another plan will be to have high-pressure mains delivering gas to various districts, and there follow the methods of the electricians, and place transformers or district governors, with the necessary regulating apparatus, in the base of special lamp-posts. This has proved very successful in the hands of Mr. Herring, who has found it most useful in his hilly district. Mr. Foulis has also largely adopted this system of local distribution by means of the same type of governor. Mr. Herring is even now fitting up a governor to withstand 3 lbs. pressure on the inlet, and to reduce the pressure to the normal town's pressure at the outlet.

Prepayment Meters and Cooking-Stoves.—Owing in a great measure to the introduction of penny and shilling prepayment meters and cooking stoves, our gas consumption in Goole has increased nearly 40 per cent. during the last three years. The advantages of gas for cooking purposes, when the heat can be so easily regulated to any degree, and kept constantly at that temperature, have been, and are being, so well kept before the public by the makers of the various kinds of stoves that little need be said here. We all know what can be done by such cookers; what we have to do is to continually remind our customers of their usefulness.

Penny-in-the-slot meters are gradually being made reliable and accurate, as the makers are realizing the enormous power which the pressure of gas has upon its parts. Taking a 3-light ordinary meter, and calculating that the pressure on the inlet is 15-10ths, it is no exaggeration to say that the ultimate strain upon certain parts of the mechanism will equal a goodly number of pounds. It will easily be seen that, unless a prepayment meter is carefully designed, this strain will be sufficient to break away some part of the mechanism. A good plan is to make the change wheel the weakest part of the whole mechanism, as this is usually the easiest portion to get at and replace; and the meter can then be repaired *in situ*. Companies would do well to send their meter inspectors to the works of the firm making the meters, to have a lesson in the peculiarities of them. Many breakages are brought about by ignorance on the part of the users of the meters; and this might be avoided by a little judicious instruction on the part of fitters and inspectors before the meter is finally handed over to the householder. Without accurate knowledge of the apparatus, however, they cannot give proper advice about the use of it.

Standardization of Meter-Unions.—Many proposals for the standardization of meter-unions have been brought before the various Gas Managers' Associations; but what has largely prevented their adoption is the great number of meters with various sized unions already in use in different works. What seems to me a good suggestion for the overcoming of the difficulty, is the adoption of a standard like the one arranged by the Board of Trade Standards Department, and for us to have all meters made to the standard. As regards the old meters already fixed, we might have short couplings with a female screw to fit the side screw of the old meter, and a male screw to suit the new standard, or *vice versâ;* so that we could at a moment's notice, by its insertion, change a new meter for an old one, or the reverse, without having to disconnect the couplings at present attached to the house pipes. These couplings would be very inexpensive, and I think would greatly overcome the present objections to any alterations. The makers of meters have shown a readiness to adopt any views we as gas managers may have on this subject.

Naphthalene.—The vexed naphthalene question has been advanced a step further by the invention and patent of Messrs. Young and Glover. There seem to be three ways of attacking this fiend. The first is by washing the entire make of gas with heavy oils, much in the same way as is done by the water or ammoniacal liquor in the ordinary scrubber—in fact, one or two bays of the ordinary "Standard" washer-scrubber may be supplied with the oil instead of water, and will serve to remove the naphthalene as the gas is being made. The second process is by diffusing through the gas as it leaves the works such oil vapours as will combine with the naphthalene in the gas, and with it condense out in a liquid form. These oils require to be of about the same vapour tension as naphthalene; and their vapours take the place of those hydrocarbons which, with the old lower temperature distillation, were carried forward with the gas and combined with the naphthalene in the liquid form. For this, all the apparatus required is a simple vaporizer, heated by steam, through which (say) 1-10th of the gas going to the town is diverted. This is to be filled with an oil boiling at 300° Fahr., but which is never heated above 212° Fahr., and at the lower temperature gives off the required vapour as the gas passes over it. The third system requires perhaps somewhat more elaborate rearrangement of the ordinary gas-making plant, as it consists of carbonizing a certain percentage of the coal at a comparatively low temperature, and carrying the gas thus obtained (kept hot by a steam-pipe inserted in the foul-main) direct to a Young's scrubber, where it is mixed with the bulk of the gas, made at the usual high heats and condensed in the ordinary manner. The rich gas obtained at the low temperature will carry the excess of naphthalene made at the high temperature.

The enriching effect by this system of two-temperature distillation is such that the illuminating power of the combined gases is increased by one or two candles, owing to the ability of the poorer gases to carry some of the hydrocarbons brought forward by keeping the gas warm which was made at a low temperature.

Mr. S. Glover has had these processes in for some years at St. Helens, and is quite free from this bugbear of the gas manager. Others, however, have tried it; but without deriving the benefit desired. It occurs to me that these gentlemen have expected the process to at once free their district of naphthalene. But this could hardly be expected for a number of months, as the processes only treat the outgoing gases; and it is only the freedom of those gases from naphthalene which will allow them to absorb a small quantity of that hydrocarbon which has previously been deposited in a solid form.

Goole Gas and Water Department.—Some short reference to the progress of the Goole Urban District Council Gas and Water Department, may not be here out of place. Dealing first with the Gas Department, the carbonizing is very effectively dealt with by means of Messrs. Jonas Drake and Sons' patent regenerative settings, erected in 1898-99, shortly after my appointment at Goole. The improved results since the adoption of this system have been beyond our anticipation, and certainly exceed the guarantee made to the Goole Council by the contractors, and the writer in urging their adoption. In comparing the results made before and after the adoption of regenerative settings, considerable improvement is noticeable: (*a*) The gas made per ton shows 16·5 per cent. increase. (*b*) The coke sold per ton shows 2¼ cwt. per ton increase. The whole works have been practically rebuilt since 1897-98, excepting the buildings, which, void of all ornamentation, were considered suitable for the requirements.

The following summary of profits will more clearly show the advantages gained by the introduction of the regenerative settings and new plant:—

Summary of Profits.

	Deficit.	Net profit.*
1897-1898	£97 7 1	
1898-1899—		
Gas reduced 3d. per 1000 cubic feet .		£1325 12 11
1899-1900—		
Gas reduced 2d. per 1000 cubic feet .		1982 5 3
†1900-1901		1220 3 9

* After the repayment of principal and interest on loans each year.
† 1900-1 Coals advanced in price 5s 5·1d. per ton. No advance in the price of gas. Meters rent free.

The remainder of the plant comprises: A battery of steel annular condensers with 14-inch connections and byepass; two exhausters and engines, 35,000 and 20,000 cubic feet capacity per hour respectively, of Waller and Co.'s type; a horizontal rotary "Standard" washer-scrubber; two tower scrubbers, fitted with Green's patent screens; four purifiers 16 feet square, and one purifier 20 feet by 16 feet, in which oxide of iron and lime are used in the process of purification; and a station meter, of Messrs. J. & J. Braddock's make, of 40,000 cubic feet per hour capacity. There are also underground storage tanks for tar and liquor, of 1000 tons capacity, and a small benzol carburettor.

The aforementioned plant is fixed at the manufacturing station, Doyle Street, Goole. After passing through the station meter, the gas flows on to the storage station (half-a-mile distant) in Bridge Street, Goole, where two gasholders are situated—one being a two lift, 80 feet in diameter, and the other a single lift, 100 feet in diameter, with cup and guide-framing fixed for telescoping when required. The governor is a 14-inch water-loading one by Cowan, fitted with their automatic pressure changer. Goole is not a hilly town, therefore no district governors are in use.

The distributing mains, of diameters ranging from 3 to 14 inches, are about 18 miles in length. The subsoil is mostly peat and silt; the soft nature and subsiding disposition of which at times causes a deal of trouble and constant attention.

During the last three years, the gas accounted for increased from 8004 to 10,152 cubic feet per ton of coal carbonized; while the gas unaccounted for has been reduced from 17 to 5·6 per cent., this having been brought about by a thorough inspection of meters, all of which have been brought in, tested, and refixed or replaced according to results of tests. All old and disused services have been cut off from the mains, old services in use renewed, new and larger mains inserted in thickly populated districts, by which means the distributing pressure has been reduced, and a more even pressure is maintained throughout the town. The hitherto frequent complaint that the consumers' accounts were excessive in certain districts near to the works, has now become a thing of the past. Meters in dispute are tested in the presence of the consumer, and an amicable settlement arrived at. Since my advent, our consumers have been increased 33 per cent., gas rentals are up nearly 40 per cent., the coke sales have multiplied over 4½ times, and tar sales doubled, while the sale of ammoniacal liquor shows an increase of over five times. The limits of the works capacity, it is expected, will be reached during the ensuing winter; and the Council have wisely secured two adjoining sites of land for the purposes of extension next year, in order to cope with the rapid growth of the Gas Department.

Coming to the Water Department, it may be mentioned that the present pumping station is situated at Rawcliffe Bridge, some 4 miles distant, whence the water is pumped and forced forward to Goole, over a water-tower 130 feet high. The water supplied from this source to the town at present is very unsatisfactory; and its excessive hardness (43° to 48°), and the presence of an abundance of red sediment (ferruginous clay), at times renders it unfit for domestic and trade purposes.

In the year 1899, the Council's application for an Act of Parliament empowering them to erect a new water-works at Pollington (11½ miles distant from Goole) was, after much opposition, granted; and the new water-works, of 2 million gallons capacity per day, is now being constructed, and completion is expected 15 months hence, at a total cost of £30,000. The water from the new source of supply is 9° to 10° of hardness. The existing water-works, at the present scale of charges, is not a profitable undertaking; but as the Gas and Water Department is worked as a joint, inseparable undertaking, the deficits of the town's necessity is ungrudgingly accounted for by its generous "gaseous" companion. It is to be hoped, however, before the new water-works are completed and the capital account thereon increased by £30,000, that the Council will realize the wisdom and necessity of conducting the gas and water matters as two distinct undertakings, when the true position of affairs will be better understood, comparisons readily made, and remedies more easily effected from time to time.

Electric Lighting.—Powers for this purpose have been applied for this year, and Royal Assent given thereto; and it is expected that an electric lighting station will be erected by the Council within the usual time-limit, in which case the companion light will be under the control of the Gas and Water Committee.

Permit me to add, in conclusion, that if in this address light has been thrown on that which is in itself illumination, I shall feel amply repaid in my effort. If I have helped to widen the outlook, I shall feel that I have contributed some little to the progressive movement in our industry. I wish the Association and its members a year of prosperity and large success. The younger members have a great future before them, many advanced positions to be taken, new discoveries to be made, and new methods of appliance to be devised; and it is hoped they will take advantage of the scientific improvement pertaining to the gas industry, and so help to realize that perfection which is the purpose of all true enterprise.

On the motion of Mr. ANDERSON, seconded by Mr. F. P. TARRATT (Darlington), the Vice-President of the Association, a hearty vote of thanks was passed to the President, who, in acknowledging the vote, expressed the hope that something in his address might suggest a topic for a paper to more than one member of the Association.

Punctually to the appointed time (2.15 p.m.), the drive was commenced to Studley Royal Grounds and Fountains Abbey; and though the return journey was somewhat delayed, all too little time was available to allow of even a cursory glance at the many rich treasures of Nature and old-time Architecture to be met with in the lovely grounds of Studley Park and the Monastery, dating back as it does to the Twelfth Century. To the Rev. G. W. Garrod, the Principal of the Ripon Training College, the members were deeply indebted for a most lucid description of the place—given with a wealth of words and a quiet humour that won frequent expressions of admiration from those who were privileged to hear him.

On reaching Ripon on the return drive, dinner was served at the Crown Hotel, and a pleasant evening spent.

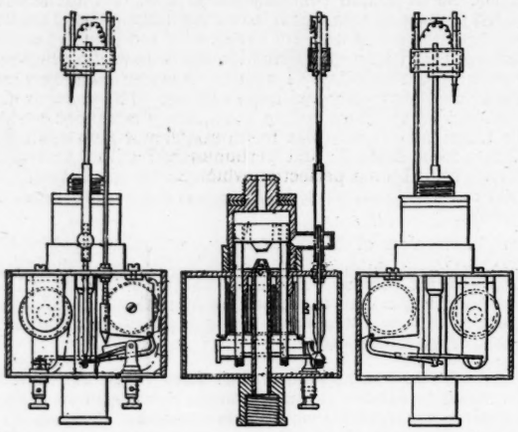
According to the Vienna correspondent of the "Standard," Dr. Carl Lueger, the Burgomaster of Vienna, whose name came very prominently before our readers in connection with the negotiations by which the Imperial Continental Gas Association lost the contract for lighting a considerable portion of the city, has received from Dr. Adolph Ritter von Offenheim a challenge to fight a duel. The challenger is a wealthy Vienna lawyer, who, as owner of several houses, refused, on principle, to pay the municipal water-rate; publicly inviting all other house-owners to follow his example. For this he was called, by the Burgomaster, at an open sitting of the Town Council, a malicious fool. Dr. Lueger has replied to the challenge that, as a Christian, he declines to fight; and, as Burgomaster, he cannot allow anyone to restrict him in the free expression of his sentiments.

One of the noteworthy features of the labour troubles in connection with the American steel trades is a movement of manufacturing plants away from "strike areas." It represents, says "Cassier's Magazine" for October, a strike factor which has probably never before come so prominently into the reckoning. Attention was more particularly drawn to it by the dismantling of the famous sheet-steel mill at M'Keesport, in Pennsylvania, which was directly induced by the recent lawless utterances of the Mayor of that town and the tradespeople's sympathy with the strikers' cause; and since then preparations have been made in several other strike-ridden communities to abandon old-established works for more congenial localities. Examples of such removal of works are not new; they can be found scattered along at intervals during the past dozen years or more. But they came singly, and therefore did not teach nearly so striking a lesson as the now threatened wholesale abandonment of towns which, in some instances, have thus deprived themselves of their sole means of support. In Great Britain, Trades Union despotism has driven some industries completely out of the country; in the United States, as now foreshadowed, it will bring about a new geographical distribution simply within the country's own borders. But the teachings of the movement are essentially the same in both cases. Where the rights of corporate bodies are no longer respected, and violence controls a community, the risks to industrial plants are too great to warrant a continuance of business.

REGISTER OF PATENTS.

Lighting and Extinguishing Distant Gas-Burners.—Forti, V., of Paris. No. 17,770; Oct. 6, 1900.

The pipe through which the gas reaches the burner is terminated by a conical portion extending into a chamber screwed on to a disc or plate through which the pipe passes. In the chamber rises and falls a piston, provided with holes and carrying two small rods, which serve as guides to the piston. The side of the chamber is made with a small aperture corresponding with an igniting-tube soldered to the exterior of the chamber. Underneath the piston is a small block of lead, designed to hermetically close the mouth of the pipe when the piston is in its lowermost position. The lower ends of the rods of the piston are connected by pins to a pivoted plate or pallet, which can be attracted vertically by an electro-magnet placed under the disc. This pallet has fixed to the side of it a small rod, which can be held in a position of the play of the pallet by a lug on the spring armature of a second electro-magnet, also fixed under the disc. Beneath the electro-magnets is a second disc or plate, also traversed by the gas-pipe, on which are mounted two terminals. One of the terminals has freely hinged thereon a strip, which lifts a pin fixed to the pallet, so as to

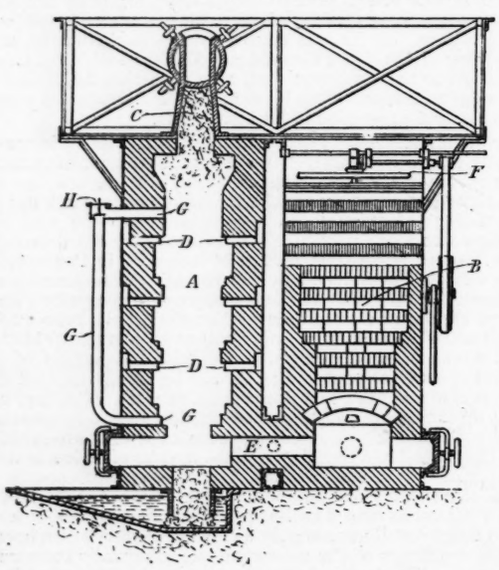


establish contact with a pointed contact maker, the position of which can be regulated by screwing it more or less upon a rod passing through the first disc. The rod, at the top, carries a platinum wire, which passes above the igniting-tube; the other end of the platinum wire being connected to a rod mounted on a small piece of metal fixed to the end of the igniting-tube. Through this tube (which forms a portion of the body of the apparatus) the return of the current is effected. The tube has an aperture opposite the projecting tube or nozzle; and inside the igniting-tube works a tube having a hole in it. This latter tube terminates below in a rod having an eye in which is engaged the end of the pin on the pallet. The piece of metal is insulated from the rod supporting frame, to which is adapted a small mica screen. The current is conducted to the terminals through a wire leading from the manipulator, which serves to light or extinguish several gas-burners.

The general construction of the apparatus described is shown in the engravings—three sectional views.

Combined Coal and Water Gas Apparatus.—Schill, C. H., and Primrose, W. G., of Manchester. No. 8129; April 20, 1901.

This invention relates to apparatus employed in the manufacture of combined coal and water gas, comprising a vertical generator in which the coal or other substance fed in at the top is lighted near the bottom



and consumed, and a regenerator heated by the products of combustion passing into it from the generator, and supplied at the required time with water, which becomes converted into superheated steam, and is eventually decomposed into hydrogen and oxygen, which flow back and up through the green or raw fuel at the top of the generator, and subject it to destructive distillation—the vapour or gases thereby liberated combining or mixing with the gases from the regenerator, and passing away with them through the outlet to a gasholder. The object aimed at is stated to be "to facilitate combustion, and to prevent caking or clinkering of such fuel in the generator as has that tendency . . . by the arrangement, use, and application of a smoke-pipe or passage (or more than one) leading from the upper part to the lower part of the generator."

The accompanying illustration shows a sectional elevation of apparatus for the manufacture of gas according to Lane's patent No. 17,762 of 1900.

A is the generator, B the regenerator, C the fuel which is fed into the top of the generator, D the series of air-inlets, E the passage connecting the lower extremities of the generator and regenerator, and F the revolving distributor for spraying water upon the highly heated checker-work in the regenerator. This apparatus is substantially of the construction, and operating in the manner, described in Lane's patent. According to the present improvements, a smoke-pipe or passage G is employed leading from the upper to the lower part of the generator, and preferably fitted with a valve or damper H. The effect of this passage is, by providing an outlet in the upper part of the generator, to cause an up-draught of part of the blast introduced through the blow-holes D, and to conduct part of the smoke generated from the raw fuel in the upper part or zone between the pipe and blow-holes in the generator, and introduce such smoke near the bottom (as shown), or at any desired intermediate point, where it ignites. The products of combustion pass along the passage E into the regenerator B, together with the products of combustion from the down-draught.

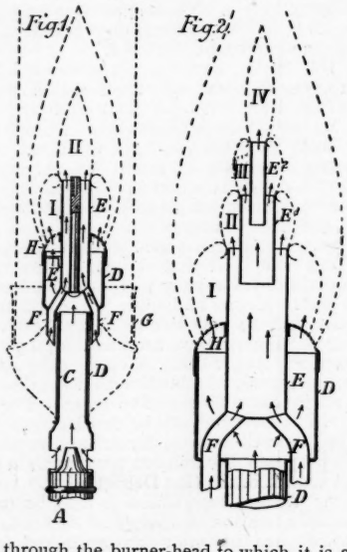
In some cases, an air-blast or equivalent means may be employed, in communication with the smoke-pipe or passage G, in order to regulate the flow of smoke; and, in furtherance of this object, additional valves or dampers may be employed if required, and such valves, as well as the valve H, may be actuated either automatically or by hand, as may be most advantageous.

Gas-Producers.—Taylor, M., of Paris. No. 14,183; July 11, 1901.

In his specification, the patentee remarks that, in gas-producers operated at a pressure either under or above the atmospheric pressure (and especially in producers for supplying gas-engines of the kind referred to in patent No. 1858 of 1899), it has been found that it is advantageous to work at a high temperature. But the intense heat resulting therefrom rapidly disintegrates the refractory material which is in contact with the incandescent fuel. It is therefore advisable to provide for the renewal, not only of the refractory material, but also of the metallic casing surrounding it, as the casing may become deteriorated if the disintegrated refractory material be not renewed in time. The object of the present invention therefore is to provide means whereby the refractory material and the metallic parts can be readily and quickly renewed, without disturbing the joints, "which are so important in a gas-producing apparatus."

Burners for Lighting or Heating.—Zehnpfund, K., of Berlin. No. 14,250; July 12, 1901.

This invention relates to a device intended to produce a pure non-illuminating flame (blue flame) by arranging in the centre of a bunsen flame, according to the size of flame desired, an air-supply pipe, or several such pipes lying in tiers one above another, and having their mouths directed upwards, so that the pipe, or tier of pipes, ends at or above the border line of the lower air-cone, or forms a continuation of it through the outer rising cone of air. This air-supply pipe (which may, if desired, be terminated above in a widened mouth) passes preferably through the burner-cap, and is projected below, in one or more



continuations, through the burner-head to which it is attached. The object of this pipe consists in drawing atmospheric air from outside the burner, and finally conveying it to the core of the flame, in tiers, in such a way that the air first prevents the possibility of an excess of gas in the bunsen flame for a suitable length of it, and, secondly, produces an improved hottest zone (second, third, fourth, or the like zone) approaching that of an explosive gas mixture. At the same time, the tube arrangement carried up into the flame has the effect of causing the

lower air cone—that is to say, the hottest zone, or several such standing one above another—to spread out at the periphery of the flame, and to come against an incandescent body fitted or placed over the latter; and the flame is thereby brought to a very intense heat.

By the free air supply upwardly directed to a suitable height inside the flame (if desired, in several stages or tiers), a sharp upward draught is produced, which may be increased in the ordinary manner by a chimney or tube. The sharp air draught—which is only directed upwards, and is impeded by no obstructions—produces, on account of its suction action, an increase of gas pressure inside the flame, and causes it to have an action resembling that of compressed gas. In this way, it assists again the constancy of the flame, which is indispensable, more particularly for the purposes of incandescent gas lighting, especially in the case of a long extended bunsen flame.

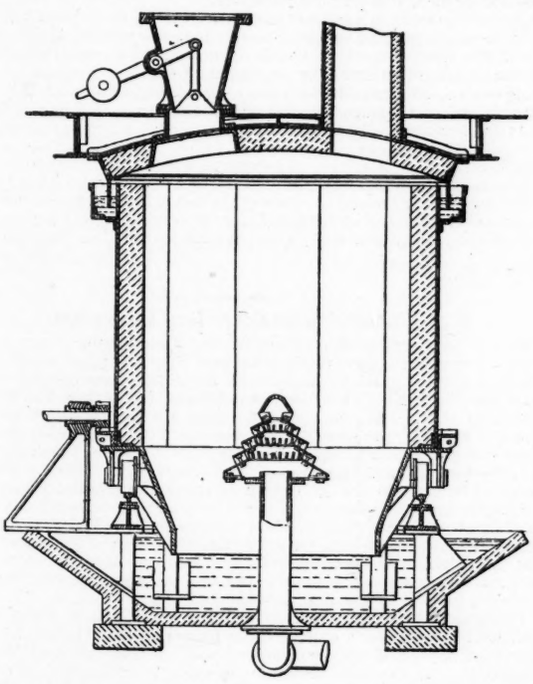
The apparatus described is shown, in a single form of construction, in fig. 1. The arrangement of the air-supply pipe in the burner in a multiple arrangement—which serves for producing multiple air cones, or rather multiple hot zones lying in tiers one above the other—is shown in fig. 2.

The ordinary bunsen tube C, with nozzle A, carries a pipe D, on which a gallery G may be fixed. In the widened pipe of the tube or burner head D, an air-supply pipe E, surrounded by a burner cap H, is arranged, which is fixed, by means of passages F, in the burner heads, and may be provided in the centre with a bar or tube for holding an incandescent mantle-fork. The direction of the current of gas and air through the pipes F E, and that of the mixed gas and air, is shown by arrows; and the form of the flame, and that of the air-cone, or rather the position of the hottest zones, is shown by dotted lines. If, for instance, the construction shown in fig. 1 be selected, two hot zones or two air cones I. and II. are formed by the simple pipe E, which projects into the flame and is open above, of which cones the lower one is expanded outwardly, and the upper one, as a continuation of the lower one, is somewhat widened upwards. If the air-tube E, which is open above, has a further continuation upwards—such, for instance, as E^1, E^2, and so forth, as in fig. 2—fresh hottest zones or air cones III. IV., and so forth result, each cone of which forms a continuation of the under one, and alters the shape of the preceding one. At the same time, the actions described take place; and a suitably shaped flame, entirely free from illumination up to its extreme point, and of intense heating power, is produced.

Gas-Producers.—Duff, J., of Liverpool. No. 15,646; Aug. 2, 1901.

This invention has for its object "to improve the construction of gas-producers so as to increase their efficiency, and at the same time reduce the labour required in working them."

As shown, the producer consists of a shell or casing lined with fire-brick, and fixed at its lower end to a depending tapered metal piece, which dips into a water seal in an ash-trough formed with sloping sides. The depending piece is provided with rollers or wheels arranged to travel on a circular rail fixed to a beam attached to supporting pillars. With this device, the fire-brick casing, with its depending piece, can be turned round; the parts being rotated by a driving pinion, arranged to act on a circular toothed rack fitted round the shell. The casing is provided with a metal cover, having an inner lining of fire-brick; the cover being fixed to, or suspended from, the charging platform, so that it does not interfere with the rotation of the vertical casing. The cover is formed with a depending spigot part, which dips into liquid in a trough formed round the upper end of the casing. By this means, the vertical casing is effectively sealed or closed at its upper



end. A fuel-charging box is fitted on the casing cover; the opening at the bottom of the box being controlled by a weighted plug or valve. The gas escapes from the producer by an outlet also formed on the casing cover. Air for combustion or gasification is led from suitable blowing apparatus to the fuel bed by pipes connected to a stand-pipe arranged in the lower part of the producer; the pipe extending up some distance into the depending tail-piece of the vertical shell. The stand-pipe is formed with a flange at its upper end; and on this flange is mounted a cone-shaped blower-piece or air distributing nozzle, consisting of a series of sloping annular plates, overlapping each other (louvre-board fashion)—curved vanes being arranged all round the annular openings left between the plates. The bottom ring is fixed to a perforated plate attached to the stand-pipe flange. All the rings composing the blower-piece are preferably fixed to each other by screw-bolts; the curved vanes acting conveniently as distance-pieces between the rings—the openings between the rings being made comparatively wide. The blower-piece has a cap or cover, fixed to the top ring.

The action of the apparatus is as follows: After the producer has been charged with fuel, the vertical shell is turned slowly round; and this slow rotating movement, combined with the polygonal contour of the lining of the shell, has the effect of twisting the fuel-bed so as thereby to break it open, and thus feed the fuel down to the blower-piece or air distributing nozzle in an open condition. The air issuing from the blower-piece is thus allowed to distribute itself freely and uniformly through the fuel, so that a rapid rate of gasification is obtained. The curved vanes on the blower-piece act as baffles, and impart a swirling or circular movement to the air as it issues from the blower-piece, and thereby prevent the issuing air from being too directly and forcibly blown upon the lining of the producer. They likewise prevent the formation of adhering clinker, as well as the overheating of the shell-plates. The blower-piece is "thus better adapted for the more rapid rate of blowing required to meet the greater rate of gasification."

The patentee remarks that "the automatic method of breaking up the fuel in the producer dispenses with the ordinary laborious process in which long iron rods, worked by hand, are used for stirring and breaking up the fuel-beds. The automatic process is, besides, much more efficient, as the automatic breaking up action is non-intermittent; and the fuel generally is also more thoroughly stirred or broken up, so that any caking or clinkering difficulties in connection with the fuel are effectually prevented."

APPLICATIONS FOR LETTERS PATENT.

18,968.—Gary, J., "Heating and cooking stoves." Sept. 23.
19,012.—Bellamy, A. R., "Gas and similar engines." Sept. 24.
19,050.—Potter, W. G., "Lamps." Sept. 24.
19,081.—Gardner, R. C., "Coin-freed gas-meters. A communication from W. M'Donald and A. E. Wright. Sept. 24.
19,123.—Rowbotham, W. & K. A., "Gas or other engines." Sept. 25.
19,152.—Dibdin, W. J., and Woltereck, H. C., "Manufacture of oil gas." Sept. 25.
19,179.—Jennens, J. S., "Gas engines." Sept. 26.
19,239.—Glover, R. T. & J. G., "Coin-freed mechanism." Sept. 26.
19,247.—Ihle, G., "Bunsen burners for incandescent lighting." Sept. 26.
19,364.—Burn, T. T., and Hinks, J. W., "Gas globes and shades." Sept. 28.
19,373.—Helps, G., "Generation of water gas in coal-gas retorts." Sept. 28.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Gas Heating.

Sir,—We consider the article on p. 836 of the last number of the "Journal" a gross injustice, to say the least of it, to ourselves; and the remarks are utterly uncalled for. The trade in the "so-called gas-fires" may have "fallen into a deep rut" so far as the cheapest things are concerned; but those who have any artistic judgment, and who are prepared to pay for artistic and good work, can obtain it. This is not advertised in the gas papers, as the readers of these are not, as a rule, the persons who purchase this class of work.

You state that "something better has not been attained in practice," and that "one never hears nowadays any claim made for improved efficiency." In reply to this, we beg to say that in our current list will be found two series of tests under exact conditions which can be again verified. In stating that "the old firms do not stir a finger to lift the trade out of a rut," we must ask to be excluded from the "old firms" referred to. The published experiments of our Mr. Fletcher, which are as a drop in the ocean compared with unpublished ones, show a determined (if commercially unprofitable) intention to keep out of the "rut," as far as buyers will permit. A departure they will not have is no departure in practice. The one class of "so-called gas-fire" which purchasers *will* have, in spite of all warnings or advice, is one of the most, if not the most, wasteful ever devised; and, from one point of view, it may not be to our credit that we were the inventors and patentees of this, the now universally made hollow-ball fire, which buyers prefer to all others. For the last ten years we have made and sold other forms which give from 60 to 70 per cent. higher efficiency in radiant heat; and we have for some time past been supplying an improved form, which gives in ordinary working practice double the duty for the same gas consumption, as compared with the best ball fire ever made. We trust this is a *little* improvement.

"Even the non-firing-back burner . . . has gone quiet." This is news indeed to us. We have a large number of special machines, and a large staff of workmen, employed summer and winter on the manufacture of these. We have to store an immense stock in the summer to meet our winter demand; and, in spite of this, it is often more than we can do to cope with the orders received for this class of burner only. The facts are precisely the reverse of the statement made; and so great is the demand, that many of our patterns are made with this form of burner only.

It is also stated that "no particular degree of efficiency, as a burner

is ever claimed for the usual gas-fire burner; and the relative position of 'fuel' to the atmospheric flame is in this case a matter of accident." With regard to the efficiency, we state this in our list in the plainest possible language—giving the radiant heat evolved for different gas consumptions under different conditions; and the statement as to the position of the burner can be easily proved to be incorrect, so far as any of *our* fires are concerned, by moving it to any other position. The advertisements in the gas publications naturally refer only to those patterns which are hired out in large numbers by the gas companies. Orders for the best class of work rarely come through hiring companies or wholesale factors, through whose hands the bulk of the cheap trade passes; and it is on this trade that most of the makers depend almost entirely for their business.

We trust that, in common fairness, you will give insertion to this reply to what we consider to be a most unjustified and uncalled-for attack on ourselves and other manufacturers as regards our competence and knowledge of the business, and one which is liable to do us a serious injury in quarters where we are not sufficiently known. We have supplied for many years past "so-called gas-fires" and electric radiators in any style, to architects' specifications, in various bronzes, porcelain enamels, &c., complete with mantels and overmantels to match; the whole of the work being done on our own premises, under our own superintendence, without outside assistance of any kind. But naturally these are not the things which are hired out or sold by the thousand, and they are not things which any gas company can deal with; nor are the designs published or sent about broadcast.

FLETCHER, RUSSELL, AND CO., LIMITED.

Warrington, Oct. 3, 1901.

Auditing of Gas Companies' Accounts.

SIR,—It is very satisfactory to hear from Mr. Newton that we agree on so many points. Mr. Newton's article is most clear. There is little room for any ambiguity; and, theoretically, he is very correct. Practically, however, his enthusiasm seems to have carried him a little too far.

When I speak of auditors remaining in their present positions, I mean the positions they are supposed to be in. I do not for one moment suggest that they should continue to sign for work they do not do, &c.

Referring to Mr. Newton's article (see "JOURNAL" for Aug. 20), where he says that the policy of auditors should be "first making themselves thoroughly acquainted with the whole of the system on which the accounts of the company are kept—from the most elementary entries, right through all the intermediate books, up to the final accounts; and then making it their practice (without following any set routine, by which the staff could obtain foreknowledge of what the auditors would or would not examine) to check from time to time some of the entries in every book, tracing the entries through to the balance-sheet. In other words, to audit samples; it being impossible to examine the bulk. It should be added that every auditor would do well to acquaint himself with the system of inter-staff examination adopted in any company whose accounts he has to audit; in order that he may be the better able to judge of the value of such certificates as are laid before him—always, of course, remembering that these certificates only supplement, and do not in any way dispense with, his own personal testing of the accuracy of the books or returns certified. Wherever possible, the accounts of one department should be vouched for by the members of another and independent department. Auditors should not hesitate to represent the need for such a system to the directors of companies." I agree with this policy entirely; but I do not see, from anything Mr. Newton has said, any very practical way of carrying it out.

For instance, dealing with the article *seriatim*, how is an auditor to satisfy himself, if he did visit the works when alterations and extensions, &c., were going on, that the expenditure of capital was really being made upon enlargements or improvements and not upon renewals? On what knowledge of principles involved is his satisfaction to be based?

Again, I am prepared to accept Mr. Newton's dictum that "the amount shown in the capital account as expended on plant should be represented by plant of that value maintained in efficient repair." But when Mr. Newton speaks of setting aside each year a percentage on the cost of holders out of revenue for eventual replacement, he seems to me to be a little too theoretical. The view that the accumulation of a depreciation fund should take place during the life of the holder, is quite correct; and the same might be said with regard to any other portion of the plant of a works from a three-light meter to a gasholder. But I fear the basis of such percentage would be a very empirical figure. Would not the case be met by a general depreciation or reserve fund?

Is it not futile to suggest that auditors should endeavour to ascertain whether works are being maintained in fair repair, and not allowed to unduly depreciate? How is this to be done by auditors?

Does not Mr. Newton go too far when he talks of auditors inspecting buildings, machinery, &c., "to prove to them that the money spent was really represented by value received?" Where are the auditors who would be any the wiser after such inspection?

There should be no difficulty in verifying stock-books, as to meters, stoves, &c., where such books are properly kept.

Discussing coals and general revenue purchases, Mr. Newton shows very clearly the difficulty the auditor has to maintain a thorough check against fraudulent manipulation.

I do not agree that the wages book is the most difficult to officially check. A proper system of time and pay sheets, together with an intelligent division of the work connected therewith, leaves little room for fraud.

The rental ledgers can be checked very effectively by auditors, without much trouble.

Mr. Newton is not, I think, correct in his ideas of checking unaccounted-for gas quarter by quarter.

I agree with most of what Mr. Newton says under the head of balance-sheets; but I see some difficulty in auditors checking the stock of coal, coke, tar, liquor, &c.

In making these remarks, I have not gone into every little difference; but I think enough has been said to show conclusively that the auditor of to-day is not sufficiently acquainted with the technical side of gas-works to go quite as deeply into facts and figures as Mr Newton desires. The essence of all auditing is, I think, contained in the portions of Mr. Newton's article already quoted; and if these essentials can be carried out, auditing will have an increased importance.

In his letter of Sept. 7, Mr. Newton asks what my remarks have to do with the responsibilities of the auditor! Clearly, I intended them to show that an auditor would be unable to cover anything like the ground Mr. Newton maps out for him; and this view I believe is still clearly sustained. Mr. Newton tells us that the auditor is to provide means whereby the shareholders may be protected against the dishonesty of the directors, the manager, or any of his staff. Now, in a practical sense, how far can the auditor carry this out?

Mr. Newton shows clearly from his own remarks under "Revenue," apart from other points I have now called attention to, that no auditor can maintain a thorough check against "fraudulent manipulation." This is plainly an admission that auditing at its best—where there is a thorough system—is useful in but a very comparative degree. It would thus seem pretty clear that shareholders never can be altogether protected against the dishonesty of directors or managers, by any amount of auditing.

Mr. Newton, if I understand him, looks for a remedy for this state of affairs in system and in the auditor assuming a responsibility for checking work and figures that he is not, even in Mr. Newton's analyzed opinion, qualified to do, and by his obtaining increased fees. Would it not be just as well to look to *system* only—in the auditors seeing that the various gas companies whose accounts they audit have a thorough system of accounts (working and commercial), with which the auditors and the manager are thoroughly conversant; and that in giving their certificates, they state clearly what ground has been covered by their audit, so that the directors and shareholders are not misled by a general certificate which would appear to cover all kinds of work that has never been touched? In this manner, the value of an audit could be appraised on a basis of the ground actually and capably covered, rather than by the ground it was supposed to cover.

Further, I am inclined to the opinion that it would be well also to admit the somewhat restricted area that can be checked by the auditor so as to bring into high relief the responsibilities that directors and managers must have, and in order that shareholders and others may be cognizant of the fact that good auditing cannot make up for indifferent or untrustworthy managers. Judging from some of the low salaries paid, this fact is none too well appreciated. Many directors and most shareholders attach far too much value to the auditor's certificate.

The system, however good it may be, cannot be effective without the intelligent co-operation of the manager, whose intelligence and integrity should form the bulwarks of the ship. In all the cases of fraud referred to by Mr. Newton, had there been a system of accounts known to the auditor, and he had carried out his check conscientiously in accordance therewith, they could not, I think, have escaped attention.

Where there is a rational system of book-keeping, there can be nothing very complex in setting out exactly every check that should be made. Such setting out should, in my opinion, be done by the auditor, and laid before the directors and shareholders; and they could say what checks they are prepared to pay for, and what they are not. The auditors' duties would then be clearly defined, and they would sign for the work they did, and no more. The signing of a general certificate of audit when perhaps not one-tenth of the necessary checks have been made, is misleading in every way; and, as Mr. Newton says, it is akin to obtaining money under false pretences.

I agree that auditors are necessary, and that the fees they often receive are not in proportion to the work they are supposed to do. But I think Mr. Newton would be unable at the present moment to find any auditor capable of undertaking the checks he wishes to institute.

Directors and shareholders require to be educated up to the value of auditors' work; for at present they have so little conception of it that, for 15 or 20 guineas, they expect an examination of accounts that would be cheap at 100 guineas.

Personally, I am much obliged to Mr. Newton for the attention he has given to this matter. It is generally indifferent book-keeping that is the cause of our finding so many works to-day harbouring indifferent machinery and antiquated methods of manufacture. If correct accounts of costs and results were kept, some pet fallacies would speedily expire.

Nuneaton, Sept. 28, 1901. GEORGE HELPS.

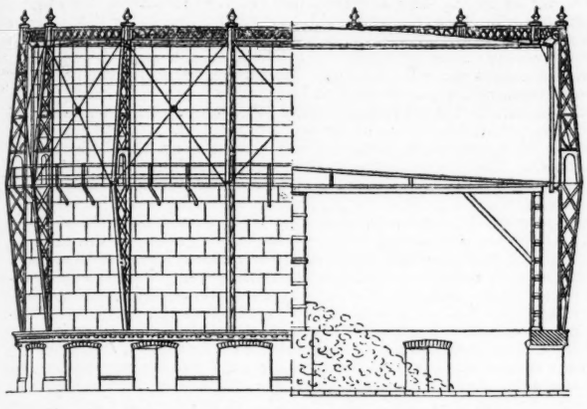
The Proposed Gasholder for Amsterdam.

SIR,—I have read with interest Mr. du Chattel's letter in your last issue. The writer objects to my statement that the principle of construction adopted in the gasholder tank for Amsterdam was long since anticipated in England by the patent granted to the late Mr. W. T. Walker in 1890. His grounds for doing so are that in Mr. Walker's patent it was not "proposed to load the roof of the intervening central space of the tank with a *large* quantity of water" (say, a 16-inch depth), but only with a "*small* depth of water" (say 4 or 6 inches). But if reference be made to the description of the patent referred to, and to the illustration accompanying it, it will be seen that, in addition to the small depth of water, the horizontal radiating rafters had to carry the weight of the wood framing for supporting the crown of the holder; so that the weight of this framing must be added to that of the water, the the tank top sheeting and rafters, and the gas pressure, when determining the thrust on the diagonal struts.

The accompanying diagram (p. 917) is a reproduction of the illustration of Mr. Walker's tank, as it appeared in the "JOURNAL" for March 31, 1891, and may be compared with the illustration of Mr. du Chattel's tank, as given in the "JOURNAL" for the 17th ult. Of course, both are only simple diagrams; but it will be seen at a glance that the principle of the inclined struts to mutually support the side and top of the tank is common to both. This alone is what I contended for in my letter to the "JOURNAL" of the 24th ult.; and I cannot see that Mr. du Chattel's reply in any way shakes my conclusion.

No matter which plan is adopted for loading these struts—whether

it be by loading the top with water only, or with framing and water, or with framing only; whether it be fully up to, more than, or less than, the most advantageous pressure to put on the struts to give the most effective support to the side of the tank—it can scarcely be denied that the principle is the same, and that the principle proposed for the Amsterdam tank is therefore not new, but was anticipated in England more than eleven years ago.



The manner in which Mr. du Chattel has worked out this principle in actual practice, as applied to the proposed holder for Amsterdam, is very ingenious. Although no details are given, the outline sketches accompanying his paper are sufficient to show that the design is a very bold one, contrived with a view to meeting the most difficult conditions—conditions that are happily, seldom, if ever, to be met with in this country.

I cannot conclude without expressing my gratitude to Mr. du Chattel for his highly instructive contribution to gas engineering literature, and also for his kind appreciation of my small efforts in that direction.

71, *King William Street, E.C., Oct.* 2, 1901. F. S. CRIPPS.

Income-Tax Commissioners and Allowances for Wear and Tear.

SIR,—My Company are claiming a percentage allowance from their taxable profits in respect of wear and tear of machinery and plant—including mains and services and meters. The tax authorities are prepared to allow a percentage in respect of the wear and tear of the gasholders, but decline to allow more than the actual expenditure within the year on which the assessment is based, in respect of renewing mains and services and meters. They allege that this is the universal method of dealing with the matter.

I fail to appreciate the reason for allowing a percentage in the one case, and only the actual expenditure in the other. The matter seems to me to be an important one; and if any of your readers can give me a reference to any district where a percentage is allowed on mains and services and meters, I shall be obliged, and will gladly reciprocate the kindness.

Ferndale Gas Offices, Pontypridd, Sept. 28, 1901. JOSEPH SPRAGUE, Secretary.

City of Santos Water Supply.

SIR,—The paragraph translated into English in the last "JOURNAL," p. 856, is very interesting; but it is only just sufficient to incite your readers to ask for more. It would be very useful information, and most helpful to a number of your readers, if some further portion of the valuable report referred to was translated—showing the number of inhabitants, description of meters, number in use, and the methods adopted to ascertain the difference between the quantity of water sent into the city, and the quantity vended by meter. The statistics obtained from this valuable installation of meters, with the method adopted in fixing, inspection, testing, and cleaning, &c., will be much appreciated by many readers of the "JOURNAL," as well as by a progressive

Oct. 5, 1901. METER SUPERINTENDENT.

Woodbridge District Water Company.—At the first statutory meeting of the Woodbridge District Water Company (which has been incorporated by Special Act, and empowered to construct works and supply water to certain portions of the parishes of Woodbridge and Melton), it was stated that a contract had been entered into for the sinking of a well into the chalk. The land, both for the reservoir and the pumping-station, had been purchased; and it was hoped that by next Christmas twelve months the district would be supplied with water from the works. Out of the capital issue of £12,500, all had been subscribed except £500; and it was hoped that the remaining shares would be speedily taken up.

Loans for Public Works.—According to the annual report of the Public Works Loan Board, issued last Wednesday, the Commissioners, in the twelve months ending the 31st of March, 1901, made 1684 advances for sums amounting to £5,883,156, as compared with 1751 advances for £7,247,670 in 1899-1900. Of the total amount, £5,825,871 was advanced on the security of local rates, and £57,285 on that of property. The average rate of interest received was £3 1s. 10d. per cent., against £2 17s., £2 15s. 6d., £2 18s., and £3 10s. 3d. per cent. in the four preceding years. There is an outstanding balance of £37,094,302 6s. 10d., of which the sum of £34,936,200 2s. 2d. represents loans on the security of local rates, and £2,158,102 4s. 8d. loans on property.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Oct. 2.

(*Before the* LORD CHIEF JUSTICE.)

Voelker Incandescent Mantle, Limited, v. Welsbach Incandescent Gas-Light Company, Limited.

This was a motion for an injunction restraining defendants from issuing circulars containing threats.

Mr. BOUSFIELD, K.C., and Mr. NEILL appeared for the plaintiffs; Mr. TERRELL, K.C., for the defendants.

His LORDSHIP said he had read the affidavits; and he noticed that defendants had commenced an action to restrain infringement. Therefore an injunction would not be granted, unless it were shown that due diligence had not been exercised.

Mr. BOUSFIELD said he thought he could show that this was the case here. The writ was issued on Dec. 20, 1899; an order for directions was made on Jan. 30, 1900; and the statement of claim, which was to be delivered in a month, was not delivered till March 21. On April 26 an order was obtained for further particulars of breaches; and in December, the action not having been prosecuted, the Voelker Company applied to have it dismissed. On Jan. 1 last the particulars were delivered. The defence having been put in, notice of trial should have been given before April 12; but it had not been done. On June 27 an order was obtained for letters of request to issue to examine witnesses abroad; but nothing had been done under it. The only excuse for the delay was that plaintiffs had not been particularly active in the sale of mantles.

His LORDSHIP observed that the threats appeared to have been going on for a considerable time.

Mr. BOUSFIELD said the defendants had recently embarked on an organized attack upon plaintiffs' customers, which had had the effect of stopping their trade. It was not a question of isolated threats, but of organized attacks.

Without calling on Mr. Terrell,

His LORDSHIP said he was not satisfied in the present state of matters that he ought to grant an injunction; and therefore the application would be dismissed—the costs to be costs in the cause.

The Cupar Gas Company's Tar Contract.

In the Cupar Sheriff Court, on the 27th ult., Sheriff Armour heard agents in connection with the petition of the Cupar Gas Company, Limited, against Messrs. W. Briggs and Sons, Limited, chemical and asphalte manufacturers, Dundee and Ladybank, praying the Court to grant warrant to the pursuers to sell, by public roup or private bargain, the tar and ammoniacal liquor made and to be made by them during the year from July 21, 1901, to July 21, 1902, so far as the defenders have not taken delivery thereof. (See *ante*, p. 847.) In their answer, defenders denied having refused delivery, and stated that their tank-waggons were waiting at Cupar Station. They also held that the tar and liquor were not of the requisite strength and quality. The Sheriff said the pressing matter was what was to be the interim order. They were not there to decide the main question. Mr. Pagan, who appeared for the Company, said he was not asking his Lordship to decide the main question. He held that the defenders, having rejected the goods and said they would not take them, were not entitled at the last minute to change their minds and say they would take them. He explained that, the defenders having broken the contract, he was no longer bound by it. This action was supplementary to a leading action, in which the defenders were sued for £200, being the price of tar and liquor supplied to them for the year ending the 21st of July last, at a restricted rate per ton of coal carbonized, and for £500 damages for failure to implement the contract for the current year. The Sheriff remarked that the position seemed to be that originally the defenders wanted to break the contract, and the Company would not allow them; and the defenders now wanted to hold by the contract, and the Company wished to break it. Mr. J. K. Tasker, who appeared for the defenders, said the petition was simply presented on the footing that the Company's tanks were so full of tar that, unless they had it cleared out, the town would be plunged in darkness. The defenders' tanks were lying at the station, and had been there for several days, to take away the tar as soon as the Company would allow them to get it. The defenders proposed to consign £150 with the Clerk of the Court; and a joint minute could be put in, reserving claims of every kind, and the present petition could drop. The £150 was on the way; and on its arrival it would be lodged. Mr. Pagan said if this was done, he would be quite satisfied.

Stealing Scrap Iron from the Belfast Gas-Works.

Detective-Constable Houston, of Belfast, happened recently to notice a quantity of scrap iron that had evidently been in use at the Corporation Gas-Works accumulating at a marine store; and, being under the impression that the Corporation did not dispose of metal in that way, he determined to find out how it got there. After a conference with the Assistant-Manager (Mr. Sharpe) at the gas-works, he kept watch in the Ormeau Road; and, before long, he was rewarded by seeing a tank-cart leave the gas-works, and proceed to the yard of a man named M'Guinness, where the driver, John M'Neice, delivered a quantity of scrap iron of the kind described. Thereupon the detective charged the latter with the larceny of the material, and the former with receiving it, and placed both men under arrest. When they were brought before the Magistrate at the Police Court, witnesses deposed to having bought scrap metal from M'Guinness; and, after other incriminating evidence had been given, the prisoners were returned for trial to the Recorder's Court. When before His Honour Judge FitzGibbon, M'Neice pleaded "guilty," M'Guinness "not guilty." However, the Jury found a verdict of guilty on the count of receiving; and His Honour sentenced both men to six months' imprisonment.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

Intended Application to Parliament next Session.

The Ordinary Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice convening the meeting and the minutes of the previous meeting; and the report and accounts (which were noticed in last week's "JOURNAL") were taken as read.

The CHAIRMAN said he regretted to tell them that since the report was issued—in fact, only a fortnight ago—their esteemed colleague Mr. E. T. E. Besley had passed away. His death was very sudden—after only 24 hours' illness. He joined the Board in 1896, so that he was for rather more than five years a Director. During the whole of that time he was most assiduous in his attention to the Company's business; and they would miss his wise counsel, and the assistance they received from his knowledge of law and long experience in gas and water affairs. The Company had lost a Director who was devoted to its interests, and the Board a colleague whose genial presence would long be missed. The Directors had sent a letter of condolence to Mr. Besley's family; and he was sure the shareholders would desire to associate themselves with the Board in this expression of sorrow and sympathy. The result of the past half year had been exactly what they had anticipated that it would be; and although the Directors regretted that they had not succeeded in earning the full dividend which their Act of Parliament permitted them to distribute, yet it must be borne in mind that their failure to do so was the outcome of a carefully considered policy, which on more than one occasion had received the full sanction of the shareholders. When, at the beginning of 1900, they found that the cost of coal was double what it was in the previous year, and more than double the average price of the preceding ten years, they made a careful calculation of the extra cost that would be entailed thereby; and they arrived unanimously at the conclusion that, in view of the competition to which they were subjected and the inevitable curtailment in consumption which a large increase in the price of gas involved, it would not be wise to throw the whole of the extra expenditure—or rather the five-sixths of it which their sliding-scale permitted—on the consumers. They therefore recommended the shareholders to voluntarily bear a part of the burden; and hence the deficiencies of the past two half years. He thought it would be satisfactory to them all—at any rate, it was so to him—to know that, in spite of the depletion of their reserve fund (which he very much regretted), their policy had borne, and was still bearing, good fruit. One result was that their competitors had been kept at bay; and the other was that their small Company, whose district was hemmed in, had for the past half year—he believed for the first time in its history—the largest increase in consumption of any Metropolitan Company. He was quite convinced that neither of these results would have been achieved had they adopted a more selfish policy, and raised the price of gas to the full extent required to meet the extra expenditure. After all was said and done, Parliament gave the Gas Companies power to establish a reserve fund in order that they might be able to meet and tide over emergencies such as they had been experiencing, and to equalize the price of gas and the shareholders' dividends between the good years and the times of difficulty. At any rate, he might claim that the Commercial Company had secured the confidence of their consumers to an extent to which they had never enjoyed it before; and he firmly believed that their customers were now fully assured that it was the endeavour of the Company to use the powers given them in a fair and moderate way, and to discharge their duties to the public in a liberal and large-minded manner. In evidence of this, he might quote from the Press, which on several occasions had drawn a comparison most favourable to the Company between the relative cost and usefulness of gas and other systems of illumination. A still more reliable indication of public opinion was the fact that the electric light had not been making progress in the Company's district; and he heard that those responsible for introducing it were by no means satisfied with the result of their efforts. He might mention that, in order to induce the public to make a larger use of the Welsbach burner, they had undertaken to renew the mantles and keep the burners in order at a quarterly charge of from 9d. to 1s. per burner, according to the number of burners employed. They also supplied and fixed the lights at cost price. He thought this would do a great deal to demonstrate to the public the paramount advantages of gas over other forms of light, and also the economy which resulted from its use. If they would turn to the accounts, he would mention one or two points which required explanation, or which involved some future action on the part of the Company. From the revenue account, it would be seen that they had spent on coal and oil £128,756, which compared with £104,279 in the corresponding half of 1900, or an increase of £24,477, nearly all of which was owing to higher prices. A little, however, was due to the extra amount of coal carbonized. The cost of coal into the works was 18s. 6¾d. per ton, as against 16s. 7d. in the corresponding half year; and the price of oil rose in sympathy with coal. Salaries and wages were £1183 more, owing to the fact that more gas was manufactured, and also to the fact that the stoking machinery at Poplar was out of use for repair for some time during the half year. Lighting and repair of public lamps cost £394 less, which was due to some of the lamps having been taken off, and electricity used instead. Turning to the item of rates and taxes, it would be seen that this figure was £9497, against £7753 last year. This was an increase of no less than £1744. It was an item which was always increasing, and one which fell very heavily on companies such as theirs. He could not help here indulging in a grumble, that they, without having any voice in the making of the rates or the spending of the money, should be mulct in large sums in order to bolster up a competitive light which was of very little use in a district such as theirs was. He knew that it was very little good protesting; but it was due to the shareholders, to the Directors, and to the public that the protest should be made. There was one other item to which he would like to draw their attention—namely, discounts, which amounted to £1915, or an increase of £620 over last year. For some time past, it had been the practice of the Company to allow a discount to the users of gas for power purposes, because they took their supply in the daytime, when the plant was not required for the manufacture of gas for lighting—which was very convenient to them. The Directors had resolved to extend this system to those who during the year paid £1000 and upwards for gas. Apart from the fact that the wholesale buyer had the right to purchase his goods cheaper than the retail buyer, it cost the Company a good deal less to collect these large sums. He thought it was good policy to encourage, and to endeavour to keep, their large consumers, whose temptations to try experiments with other forms of lighting were, of course, greater than those of the small consumers. He did not think there were any other items needing comment on that side of the account. Their expenditure, in the result, was £210,232, which compared with £183,614 last year, or an increase of £26,618. Looking at the other side of the revenue account, it would be seen that £48,993 was received for residuals, as against £49,785, or a decrease of £792. This decrease was almost wholly due to the large drop in the price of tar, which realized £2481 less. At the same time, he wanted to digress a moment in order to draw the attention of the proprietors to the question of coke. The sale of coke had a most important bearing upon the amount of their profits. If they compared the accounts of the Commercial Gas Company with the accounts of the other two Metropolitan Gas Companies, they would find that for the last few years the price their Company had received for coke had been considerably lower than that obtained by the others. The price per ton they had obtained that half year was 15s. 4½d., as against the Gaslight and Coke Company's 17s. 8d., and the South Metropolitan Company's 17s. 6½d. This was 2s. 3½d. per ton less than the amount received by the Gaslight and Coke Company, and 2s. 2d. per ton less than that received by the South Metropolitan Company—an amount which was sufficient to wipe out the whole of the deficiency on their revenue account. This was the reason, and he thought the shareholders ought to know it: They would probably be aware that the Gaslight and Coke Company had works at Bow Common in the Commercial Company's district, and at Bromley just outside their district. These works produced large quantities of coke, which in former days were sold to the cement manufacturers and taken by barges down the river, so that it did not come into competition with the Commercial Company's coke. But during the last few years, the Gaslight and Coke Company had flooded the Commercial Company's district with cheap coke, which they sold at a less price than they could obtain elsewhere. The result of this was that they brought their huge quantities into competition with them, and in this way the Commercial Company's sales had fallen off to an alarming extent. He did not think anyone could possibly blame him if he protested against such a policy, which could not benefit the Gaslight and Coke Company, and at the same time did their own Company a great deal of injury. Their income from gas amounted to £197,239, as against £175,566 in the corresponding half of last year, or an increase of £21,673, due largely to the rise in price. During the whole of the past half year they were charging 3s. per 1000 cubic feet; while in the corresponding half of 1900 they charged 2s. 6d. for the first quarter (when two-thirds of the gas made during the six months was sold), and 3s. for the second quarter. Rentals of meters, stoves, and automatic meters and fittings were £959 more; and miscellaneous items £5 more. So that the total receipts (allowing for the decreased returns from residuals) were £21,844 more, which, deducted from the increased expenditure of £26,618, resulted in a diminished profit of £4774. This made their net profit £44,651, of which interest on debenture stock absorbed £5698, interest on temporary loans (after crediting the dividends on investments) took £1197, and a sum of £37,754 was left over. The Directors recommended a dividend at the rate of 12 per cent. on the old stock and 9 per cent. on the new, which would absorb £44,334, or £6580 more than they had earned. He had, he thought, already said sufficient to justify the payment of this dividend; and therefore he would not go over the ground again. He would point out that the withdrawal from the reserve fund in the last two half years amounted to £12,721; and including the last three half years, it amounted to £19,301—all of which had gone to keep down the price of gas. One very satisfactory feature of the accounts was that, in spite of the higher price charged for gas, they had sold 26 million cubic feet more, which was equal to an increase of 2 per cent. on the total sales. This compared with a decrease of 4 per cent. in the case of the Gaslight and Coke Company, and an increase of 1¾ per cent. in that of the South Metropolitan Company. He thought he ought to mention that 1½ per cent. of their increase was due to coin meters. This branch of the business had not hitherto been developed so much by them as by the South Metropolitan Company. Turning to the capital account, he did not see anything in it which called for much comment, for there had been no expenditure of importance. The first item, £2320, for new and additional building, plant, &c., included an oil-gas meter and house for Stepney and Wapping, coke-discharging plant for Wapping, and the completion of the lime-burning apparatus for Poplar. The latter, it was anticipated, would effect a considerable saving in the cost of purification. The other items were only the ordinary expenses required by their business; but they included the cost of 951 coin meters, making a total of 13,968, and 766 stoves, bringing the number to 13,518. A point to which he wished to draw the attention of the proprietors was that the capital account was over-drawn by £3330; and therefore the Directors had come to the conclusion that an application to Parliament was necessary. The amount of capital (stock) remaining to be paid up and unissued was £28,125; and the debenture stock unissued was only £46,713. This would produce about £120,000, which really was not more than sufficient for working capital for such a concern as theirs. Therefore the Directors proposed to prepare a Bill, and in due course submit it to the shareholders for their approval. They would recollect that in 1899 a Committee of the House of Commons, under Sir James Rankin's chairmanship, resolved to recommend to the House that they should not grant to gas companies capital powers more than sufficient for five years. This bore rather hardly

upon a small Company like theirs, owing to the great expense of parliamentary proceedings; but the Directors thought it was only right to give effect to the recommendation of the Committee. Therefore they only proposed to ask for an additional £500,000 of capital—£375,000 of ordinary stock, and £125,000 of debentures—which they thought would be sufficient to last them for five years. In the Bill they proposed also to include provisions for the conversion of the 10 per cent. stock into a 4 or 5 per cent. stock, the 7 per cent. stock into a 3½ per cent. stock, and the 4½ per cent. debentures into a 3 per cent. stock. This would bring them into line with the other Metropolitan Companies in this respect; and it would also make the nominal amount of their capital correspond more nearly with the market value. Owing to the introduction of the Welsbach burner, it was no longer of importance to the consumers that the gas should be of a high illuminating power; and as the process of enrichment was very expensive, it was obviously to the advantage of users of gas for engines and for cooking and heating that it should be supplied to them of a lower illuminating power at a cheaper rate. Therefore it was proposed that a clause should be inserted in the Bill enabling the Company to supply gas of 15 or 14 candle power—they relinquishing 1d. of the standard price for every candle by which the gas should fall short of 16 candles. The other provisions were not of great importance; and as they would have to bring the Bill before the shareholders for approval, he could discuss them at that time. There was only one other matter which he wished to mention. It was, however, a subject of considerable importance, and one which involved an altogether new departure on the part of the Company. During the half year, the Board came unanimously to the decision that they would introduce a scheme whereby the employees would become sharers with the ordinary proprietors in the prosperity or adversity of the Company. Therefore they offered them a bonus or percentage on their wages, variable with the price of gas. Commencing at 3s. 4d., they offered them ½ per cent. for every penny that the price of gas was reduced. The present price was 2s. 8d.; and therefore it would be seen that the bonus would amount to 4 per cent. This offer was made to all the workmen of good conduct who were willing to sign an agreement for twelve months' service with the Company—thereby becoming yearly servants; but it was made with the stipulation that one-half of the amount should be paid in cash, and the other be left with the Company and invested (in the names of trustees) in the Company's stock, until it amounted to £5 of stock in any individual case, when the owner would be entitled to a certificate, and would become a registered proprietor in the Company. The Directors also coupled with the offer to allow the men to leave the withdrawable half, and any savings they might have besides, with the Company, to bear interest at the rate of 4 per cent. on sums under £20, and 3 per cent. for greater amounts. Circulars were issued to the men, and meetings were held with them for explaining the scheme. At first they seemed to hang back—partly because the Gas Workers' Union passed resolutions advising the men to have nothing to do with it, and partly because they were possessed of a proper spirit of inquiry. At any rate, he was happy to tell the shareholders that, as far as could be at present judged, the scheme had been a great success, for over 90 per cent. of the men had signed the agreements. The objects of the Board were to attach the men to the Company's service, and give them a personal interest in the success of the undertaking. No doubt the men could do a great deal indeed to promote good work and economy. Mr. Jones was satisfied, and so were the Board, that, if the men entered heartily into the spirit of the scheme, they could more than save the cost of it to the Company; and in doing so they would benefit the concern and at the same time improve their position in life by becoming proprietors of the Company's stock—owners of property. In the second place, they hoped to encourage thrift and sobriety among the men, by giving them the prospect of regular employment and presenting them with the opportunity of making provision for old age. With regard to coal, he would like to say a word about the prospects for the current half year. In April, when they met, he told them that the Board were arranging their coal contracts. These had now been completed at a price of 8s. 10¾d. per ton, which was a saving of 7s. 1¼d. over last year. They had also bought their oil at a considerable reduction. The Directors therefore felt justified in reducing the price of gas from 3s. to 2s. 8d.; and though the price of coke had since fallen off, and there was no doubt their residuals would yield less, still he hoped they might earn their statutory dividend in the present half year. The price of coal was, however, even now 1s. 10d. per ton more than the average for the ten years preceding the phenomenal rise in 1900. He concluded by moving that the report and accounts be adopted and entered on the minutes.

The Deputy-Chairman (Mr. Walter Hunter), in seconding the motion, said he would add nothing to the Chairman's very able speech, except to emphasize his remarks as to the unjust policy of those local bodies who supplied electricity at less than it cost, and so inflicted a great hardship on the rest of the ratepayers.

Mr. Wood said that in the accounts under review the arrears for gas were close upon £9000. In the first half of last year they were £1557; and in the December six months they were about £5000. There was thus a difference between the past half year and the corresponding period of 1900 of about £7500.

Mr. Ennis remarked that though the Chairman deserved the highest compliments on the speech he had just made, there were one or two points in it to which he would like to refer. Allusion had been made to the position of the Gaslight and Coke Company in their efforts to deal with the very huge quantities of residuals with which they had to do. He imagined the real truth to be that the Gaslight and Coke Company, in their struggle to get rid of their residuals, had done what the Chairman had objected to. This, he thought, was in the ordinary course of business. As to the rebate to very large consumers, he agreed that this ought to be allowed, so long as it was confined to the amount saved in collection; but when it went beyond this point, he thought it was open to animadversion. The more rebate they gave to large consumers, the greater was the price to the small ones. If the Company granted these heavy rebates, the reduction of the price of gas must at some time or other be postponed. With regard to the Bill, it seemed to him that it would be a mistake to convert the 7 per cent. stock in the manner proposed. He thought a single consolidated stock would be of greater advantage to the shareholders; and it would be no detriment to the public interest if it were made one stock instead of two.

The Chairman said that, before the resolution was put, he would explain the question of arrears. These were all cleared away now. As he had mentioned at the previous meeting, one of the public bodies in their district had declined to pay their gas bill, because, as they contended, they had not received sufficient notice in advance of the increase in price. The matter had, however, now been settled on a satisfactory basis; and the arrears no longer existed. Regarding the question of discounts, he thought Mr. Ennis's argument would not hold water. The extra burden which might be thrown on the small consumers would be infinitesimal. The answer was that the more the Company increased their business, and the better they kept it, the more they would be able to reduce the price of gas to all consumers. Again, as to the conversion of the 7 per cent. stock. He wished Mr. Ennis's suggestion could be carried out. The Directors had tried to do it, but they could not; and if they hit upon a scheme, he was satisfied that Parliament would not pass it.

The motion was carried unanimously.

Dividends were then declared at the rates of 12 per cent. per annum on the old stock and 9 per cent. per annum on the new stock, both less income-tax.

On the motion of Mr. Ennis, seconded by Mr. Good, a vote of thanks was passed to the Chairman and Directors.

The Chairman responded, and afterwards proposed a similar compliment to Mr. Jones, Mr. Ellis, the other officers and staff, and the workmen.

The resolution having been unanimously carried,

Mr. Jones said that the older he got the heavier his burden seemed to become. He was not getting weaker; but the load was heavier. They had passed through a period of dear coal; but when they paid the highest price, they got the lowest quality. The Chairman had alluded to the policy of giving the employees (of whom he could speak in the highest terms of praise) an interest in the Company's prosperity. He (Mr. Jones) could not tell them with what pleasure he had seen the scheme introduced and accepted by the men. The daily round of the common task became monotonous; and the deadliness and the dispiriting effect of that daily work—especially when it meant severe bodily exertion—might well impress their minds with the quickening power, the interest, the vivifying effect on a man of feeling that he was going to work in future to some extent for his own advantage. Self-interest might be despised; but it did good to the individual and to the community. The best effect would be seen when the man became an investor in the Company's stock. He would try and induce the men, not to put half only of the bonus in the Company's stock, but three-quarters, or even the whole of it. He was sure they would realize an immense pleasure and interest in their work when they found that, by their skill and by their economies, they were improving the property of which they owned a humble part.

Mr. Ellis also briefly replied.

This concluded the business of the meeting.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly General Meeting of this Company was held on Monday last week—Mr. C. Lawler in the chair.

The Secretary (Mr. F. T. Cotton) having submitted the report, which was noticed in the "Journal" last week (p. 848),

The Chairman moved its adoption. In doing so, he remarked that during the half year covered by the accounts, the Company had sold 646,455,000 cubic feet of gas, for which they received £131,264 4s. 7d.; but there was a decrease in the quantity of gas sold of 26,794,000 cubic feet as compared with the corresponding period of 1900. The amount received for coke was less by £709 19s. 3d.; but breeze brought in £295 16s. 7d. more. The receipts for sulphate of ammonia were lower by £2029 18s. 8d. than in the corresponding period. They made less sulphate, and therefore had less to sell. There was also a drop of £985 16s. 6d. in the amount received for tar. The net decrease in the returns from residuals was £3429 18s. The number of coin meters in use for cooking and lighting purposes was 9928; while in 1900, it was 5616—showing an increase of 4312. The amount received in 1900 for gas consumed by means of these meters was £4613 8s. 4d.; and in 1901 it was £8935 13s. 11d.—showing an increase of £4322 5s. 7d., or nearly double. Although they were still working on coals at the increased contract price, the Board, in accordance with the intimation he gave at the last half-yearly meeting, had resolved to reduce the price of gas 3d. per 1000 cubic feet, as from the end of the December quarter. It was intended also to reduce the price of coke. The Directors recommended the payment of the usual dividends at the rates of 10½ and 7½ per cent. per annum on the respective shares.

Mr. J. R. Wigham, J.P., seconded the motion, which was carried; and the dividends recommended were declared.

Mr. F. M'Bride having been elected as Shareholders' Auditor in place of the late Mr. Thomas Brunker, he expressed his appreciation of their confidence in him, and moved a vote of thanks to the Chairman, Directors, and officers of the Company. He said he thought the report and accounts would bear contrast with the best gas company in the country.

Mr. P. J. Smyth, J.P., seconded the motion, which was carried.

Mr. Wigham paid a high tribute to the services of the Chairman and officers.

The Chairman returned thanks, and the meeting terminated.

While putting down a new valve in one of the mains at the Limerick Gas-Works on Monday afternoon last week, four men, named M'Inerney, Kennedy, Bales, and Bank, were overcome by an escape of gas. M'Inerney's case was by far the more serious. Compressed oxygen gas was administered, and three of the men soon recovered. So also did M'Inerney after two hours; but he was sent to the hospital.

COLONIAL GAS UNDERTAKINGS.

Reports have lately come to hand in regard to the working of several Colonial gas undertakings in the first half of this year, from which we extract the following particulars. The Maryborough Gas and Coke Company, Limited, had a revenue of £3111 from the sale of gas, fittings, &c., and a total income of £4352. The expenditure being £3317, there was a balance of £1035 available for distribution; and the Directors recommended its appropriation as follows: Payment of a dividend at the rate of 6 per cent. per annum, £771; to be carried forward, £264. The net profit realized from the sale of gas, &c., by the North Shore (Sydney) Gas Company, Limited, was £3732, and the balance carried forward made up a sum of £3750. Out of this the Directors recommended a dividend of 3½ per cent. for the six months covered by the accounts; leaving £31 to the good. The Engineer (Mr. T. O. Morland) reports the plant to be in an extremely satisfactory condition; and it is being extended by the addition of a holder to store 630,000 cubic feet of gas. Our readers may remember that the Rockhampton Gas and Coke Company, Limited, supply both gas and electricity. The former branch of the business resulted in a profit of £2563; the latter, in a loss of £225. The net profit for the half year (£1564) was slightly less than that for the preceding period, notwithstanding the fact that considerable extensions had been made to the gas plant. This was mainly attributable to the operation of the Shops and Factories Act, 1900, which, by making early closing compulsory, materially affected the output of both gas and electric light. The extreme depression pervading all business affairs also tended to a shrinkage in the consumption. With the view of revising the present electric light system, and placing the supply of current on a more satisfactory footing, new cables have been purchased, and certain improvements made at the generating station. The Directors recommended the payment of a dividend at the rate of 6½ per cent. per annum on the ordinary shares, and 9 per cent. per annum on the preference shares, free of dividend duty.

EDINBURGH AND LEITH GAS SUPPLY.

Quality and Price Fixed—The Illuminating Power of the Gas.

At the Meeting of the Edinburgh and Leith Gas Commissioners, on Monday last week—Sir ANDREW M'DONALD presiding—the principal business was the fixing of the price of gas for the succeeding twelve months.

The TREASURER (Mr. John S. Gibb) submitted his estimate of income and expenditure, in the determination of which, he reported, he had had the benefit of the aid and experience of the Chief Engineer (Mr. W. R. Herring, M.Inst.C.E.), who had carefully examined and approved of the items belonging specially to his own department—viz., the expenditure for manufacture and distribution, and the income from the sale of gas and residual products. Supposing the output and price of gas were continued the same as last year, the estimate showed a probable surplus of £1047. This calculation was on the basis of what the Commissioners had already agreed upon—the suspension of the sinking fund for the repayment of the money borrowed for the new works at Granton, and the minimum statutory allowances for the other sinking funds. The considerable reduction in the estimated cost of coal and oil for this year, as compared with last, amounting to £27,000, would, if other conditions had remained the same, have warranted the consideration of a reduction of (say) 3d. per 1000 cubic feet in the price of gas; but, unfortunately, against this lessened cost of production, there was a heavy diminution of income from residuals—some £15,000; and at the same time an increase of about £5000 in interest needed for the larger sums requiring to be provided for the capital expenditure still going on at Granton.

The estimate of expenditure was as follows: Coal (161,383 tons, the quantity carbonized last year), £116,402, as compared with an actual outlay last year of £141,043; gas oil (3253 tons), £12,000, as compared with £15,454; purifying materials, £10,200, as compared with £10,128; salaries, wages, and charges at works, £50,000, as compared with £50,155; and repairs on works and plant, £12,000, as compared with £11,204. The total estimated charge for the manufacture of gas was therefore £200,602, as compared with an actual outlay last year of £227,985. The distribution of gas was estimated to cost £23,200, as compared with an actual cost last year of £23,197; management, £9400, against £9724; feu duties, rates, and taxes, £10,400, against £12,495; pensions and allowances, £950, against £1075; law charges, £150, against £150; compensation for damage by accidents, £30, against £33; discounts, abatements, and bad debts, £6600, against £6572; annuities, £33,600, against £33,688; interest, £22,300, against £17,259; expenses of mortgages, £500, against £664; and sinking funds, £12,500, against £15,431. The total expenditure was thus estimated to be £320,232, as compared with an actual outlay of £348,287 last year. The quantity of gas to be sold was taken at the bulk which was sold last year (1,764,445,400 cubic feet); and the revenue to be derived from it, at the price of 3s. 4d. per 1000 cubic feet, which it was from the October survey of last year, was stated at £289,423, as compared with £280,843. Coke was reckoned to realize £10,331, against £21,482; and tar and ammoniacal liquor, £20,800, against £20,269. The total estimated revenue was £321,279; so that there was a surplus brought out of £1047.

Mr. D. PURVES, the Convener of the Works Committee, said the Committee had gone very carefully into the matter of the price of gas in connection with the reports of the Treasurer and the Engineer, and they had found that the price must remain at 3s. 4d. per 1000 cubic feet. The adjusted figures showed that they would have an estimated surplus of £1047. No doubt it must be disappointing to them, but it was due to the fact that, while they had bought coal at an outlay of something like £27,000 less than last year, there was an expected decrease in the receipts for residual products of nearly £11,000; and they had to provide a further sum of £5000 to pay interest on the money they were spending at Granton. They had also to keep in view the amount they took last year from the fund in reserve. The Committee had resolved, taking everything into consideration, to recommend that the price of gas should remain as it was. The increase in consumption, he was glad to say, was going on satisfactorily; but it depended very much upon the winter as to whether or not their output would be a heavy or a light one. But were it heavy or light, the Commissioners were in a better position than they were last year, because they could fall back upon the 6¼ million cubic feet of gas which they now had in store at Granton as a reserve. The Committee considered that the progress of the new works at Granton was quite satisfactory. They reported that they had sold 50 tons of sulphate of ammonia at a very favourable price. He moved the adoption of the recommendation.

The motion was unanimously agreed to.

The Works Committee reported that they had considered a report by the Engineer on a proposal to lower the illuminating power of the gas; and they recommended the adoption of his advice not to reduce it below the present standard. Mr. Herring's report was as follows:—

In accordance with your instructions embodied in the minute of the 24th September, 1900, I now beg to lay before you my remarks upon the issue as to whether it will be commercially advantageous, and in the public interest, to reduce the illuminating power of the gas supplied from your different works. In order to arrive at a correct conclusion in this matter, I have prepared a statement setting forth the quantities of the various descriptions of coal used from 1895 up to date, taking due note of the quantity of gas produced and the average quality of the illuminating power throughout each year, and casting out the respective quantities at the rates actually paid for the coal. I have thus ascertained the actual proportions of the various grades of coal used for the production of a 25-candle gas for each of the respective years.

From this statement I have been able to estimate the proportions of coal and cannel we would require to use to make a 20-candle gas and a 15-candle gas. I have also estimated what the cost would be.

Year.	Candle Power Gas Sent Out.	Per Cent. of Shale Used.	Actual Cost per Ton.	Estimate for 20-Candle Gas per Ton.	Estimated Saving per 1000 Feet Made.	Estimate for 15-Candle Gas per Ton.	Estimated Saving per 1000 Feet Made.
			s. d.	s. d.	d.	s. d.	d.
1895-96 . . .	25·71	24·5	11 8	9 6	2·51	8 4	3·94
1896-97 . . .	25·26	27·7	11 5	9 4	2·47	7 10	4·25
1897-98 . . .	25·68	30·2	10 10	9 4	1·59	8 2	3·07
1898-99 . . .	25·63	23·6	10 11	9 1	2·07	7 11	3·41
1899-1900 . .	25·41	9·5	12 8	11 5	1·43	10 4	2·68
1900-1901 . .	24·77	6·8	16 9	15 8	1·23	14 1	3·35
Average . .	25·41	..	12 4	10 9	1·76	9 5	3·37

To summarize this statement, therefore, and striking an average for the period of six years, had we supplied a 20-candle gas, it could have been rendered to the consumers at an average of 1·76d. per 1000 cubic feet cheaper; and had it been a 15 or a 16 candle gas, produced solely from splint coal, it would have been 3·37d. per 1000 cubic feet cheaper—the latter after taking into account the lower yield that would have been attained from splint coal only, as compared with a mixture of coal and cannel.

From a purely commercial point of view, therefore, it does not appear to be worth while disturbing the established order of things by reducing the illuminating power of the gas below its present standard, as, apart from the fact that a somewhat lesser light would be yielded, comparing the 25 with the 15 candle power per burner, the mere sentiment of the fact that its illuminating properties had been reduced would be sufficient to disturb the public mind, and undoubtedly prejudice the Commissioners' interests in the eyes of the gas-consuming public.

There is, however, another aspect of the question which is worthy of some consideration, and is one which is solely in the interests of the gas consumers. The high quality of gas in Scotland—averaging from 25 to 28 candle power—is the distinct characteristic of Scottish gas manufacture as compared with England, where the quality averages from 15 to 16 candles. I think it will be admitted that the effective illumination of English towns, as compared with Scottish towns, is on a par. This is accounted for by the fact that, whereas in our street-lamps we consume 2 feet of 25-candle gas, yielding a light under such circumstances of about 8 candles, the consumption in English public lamps is not less than 5 feet, yielding from 14 to 16 candle power—in other words, rather more of the lower-grade gas is used, but a better light equivalent is obtained.

The gas-burners at the command of the public are not particularly well adapted to the burning of gas rich in hydrocarbons. The higher the quality of the gas, the greater the tendency to smoke when burned in the ordinary way. The slightest draught—the opening or closing of a door—is sufficient to cause our 25-candle gas to curl, and emit a portion of smoke in just the same way that an oil-lamp easily smokes when improperly regulated. The best instance I can give you of this is the condition of our public lanterns after a storm; some of them becoming almost opaque with the deposit of smoke and soot brought about by the wind finding access to the burner through the apertures in the glass through which the lighting-rod is inserted. The great complaint about gas being dirty arises, to a large extent, from the tendency of our rich gas to smoke when burned in the ordinary way. Another reason for the dirtying of ceilings in the vicinity of gas-flames arises from the more rapid circulation of air in the vicinity of the burners, bringing into contact with the surface close by a larger volume of air contaminated with dust particles. This same phenomenon is witnessed in the vicinity of any heated pipes, or steam or hot-water coils. It is also witnessed, in a lesser degree, in the vicinity of electric incandescent lamps; the slight heat given off by these lamps inducing an accelerated circulation of air in the vicinity of the burner.

While it is impossible to prevent the latter undesirable effect taking place, it is possible, by supplying a gas that is more easily consumed in burners which lie to our hands, to almost entirely stop the tendency which our gas at present has to smoke; and for this reason it would be in the consumers' interests if they were to agree to accept an illuminating power of (say) 20 candles. We could give them the advantage of about 2d. per 1000 cubic feet if such were to be agreed upon; and I venture to state that they would not discover the difference in the illuminating power owing to the conditions in which the gas is commonly consumed through old and defective burners, which fail to yield anything like the full illuminating power that the gas is capable of giving when properly consumed. The incandescent burner and gas-stove, which are now so largely used, would be much more effectively served by a 20-candle than by the 25-candle gas. Should such a policy be determined upon in order to accommodate the existing conditions, and permit of the gradual renewal and change of burners, it will be wise to consider whether the reduction should not take place over a period of years—say, three years to accomplish the reduction from the present quality to the 20-candle basis.

There is no doubt that the gas-consuming public have a right to expect far more attention at the hands of the suppliers of gas than has hitherto been customary in the history of gas lighting. They have been left to the mercies of men who have, no doubt, acted to the best of their ability; but as the means of obtaining the best possible illumination from the gas available have not necessarily been part of their training, it is a matter which the suppliers of gas should undertake in the interests of their consumers. So far as our own undertakings are concerned, I do not see a better way of accomplishing this than training the surveyors or meter inspectors to serve the purpose, and relieve them of some of the clerical work they at present have to perform, by transferring this to the consumers' clerks, whose principal duty is to merely check the surveyors' entries. For some time past, we have been recruiting the surveyors' staff from the gas-fitters' shops; and I shall find no difficulty whatever in getting any number of men at the present rates, who have been brought up as gas-fitters, and who should be equipped with gas-burners and a pair of pliers, and whose duty it would be to inspect the fittings of consumers' houses, advising them what is best to be done, and fitting on new burners at the consumer's request, free of cost. The total outlay for this departure would be infinitesimal as compared with the advantages that the public would receive by such a policy. It is a policy that could be gradually inaugurated, and need not cause any serious disruption in the present organization of the undertaking; and it is one that, I think, will in the long run considerably enhance the popularity of the gas supply, particularly when we bear in mind the fact that we hope to be able to considerably reduce the present selling price when we are able to manufacture gas under more favourable conditions.

The recommendation was adopted without comment.

The Works Committee also reported that they had accepted the tender of Messrs. Graham, Morton, and Co., Limited, of Leeds, for the supply of coke-conveying plant for the Granton works.

The CLERK (Mr. J. M'G. Jack, S.S.C.) reported that the Assessors had made up the valuation of the works belonging to the Commissioners, and the amount came out at £28,606 less than it was last year. There was a decrease on the Edinburgh works of £21,800, on the Leith works of £4800, and on the works in the country of £1800.

After the meeting, the Commissioners journeyed to Glasgow, where they spent the afternoon and evening in an examination of the exhibits relating to gas supply and consumption, and the lighting arrangements in the Exhibition buildings and grounds. They were entertained to dinner in the Grosvenor Restaurant by the Chairman and Vice-Chairman of the Executive Council of the Exhibition—Mr. Shearer in the chair. A number of representative gentlemen belonging to the city of Glasgow were invited to meet the Commissioners.

INCREASED STORAGE AT THE KENDAL GAS-WORKS.

Inauguration of a New Gasholder.

A large gathering of the members of the Corporation of Kendal and their friends took place at the gas-works on the 27th ult., to witness the inauguration of a new gasholder, which has been erected by Messrs. Clayton, Son, and Co., Limited, of Leeds. The structure having been examined by the visitors, who watched with much interest the operation of testing the vessel with air, the party assembled in an adjoining store-room, where refreshments were served. Alderman Monkhouse, the Chairman of the Gas, Water, and Electricity Committee, offered a few words of welcome to the guests, and then called upon the Engineer (Mr. T. N. Ritson, Assoc.M.Inst.C.E.) to read his report. It set forth that the tender for the holder was let in December last, and that for the foundations in the following month. The latter included the taking out and removal of some 1500 cubic yards of earth, the laying down of 370 cubic yards of concrete, 700 superficial yards of cement fronting, and 283 yards of tar and sand cover around, outside the tank plates underground. The tank is circular, 90 feet in diameter, and 24 ft. 9 in. deep, and is constructed throughout of steel plates ⅜ inch thick. On the outside of the shell of the two bottom rows of plates stiffening curbs of 4 ft. by 3 ft. and 7-16th inch L steel are fixed. The 14 stanchions around the tank are formed of rolled steel joist 12 ft. by 5 ft. (36 lbs. per foot); the whole being surmounted by a platform, reached by a staircase from the ground. The tank contains 670,000 gallons of water. The inlet and outlet pipes are 18 inches in diameter, made of ⅜-inch steel plates. The holder is telescopic, in two lifts. The outer lift is 86 ft. 1 in. in diameter and 24 ft. 3 in. deep, and the inner lift 84 ft. 3⅜ in. in diameter and 24 ft. 6 in. deep. When at rest, the crown, which has a rise of 4 ft. 6 in., is supported by a wood frame fixed to the crown of the "dumpling" work. The holder is untrussed. The external framing consists of fourteen standards, 48 feet high, formed of rolled steel joists 12 in. by 5 in., and 36 lbs. per foot. The diagonal bracing is of rolled steel joists, 5 in. by 5 in., and 23 lbs. per foot. To the top gusset plates of each standard are fixed 1¼ inch wind-ties, with adjusting screws. The capacity of the holder when full is 277,000 cubic feet. There are 295 tons of steel and iron in the structure; the tank contributing 145 tons, and the holder and standards 150 tons. For the purpose of conveying the gas to and from the holder, 245 yards of 18-inch cast-iron pipes have been laid, at an outlay of £300. The cost of the whole work will amount to about £7300. The cost of the structure will work out at just a trifle over £25 per 1000 cubic feet capacity, which, when taking into account the increase in the price of material at the time when the contracts were made, may be regarded as a fairly reasonable job. This addition to the undertaking will satisfy all demands for some years to come, and, moreover, will meet a growing desire manifested at Kendal for the cessation of Sunday labour. In conclusion, Mr. Ritson congratulated the Committee upon having placed the work in the hands of such capable and trustworthy Contractors as those whose tenders had been accepted. Alderman Monkhouse next gave a brief account of the progress of the works since they were taken over by the Corporation in 1894; and the proceedings terminated. A brass plate, recording the date of the erection, is to be placed on one of the holder standards.

The Directors of the Monte Video Water-Works Company, Limited, have declared an interim dividend at the rate of 5 per cent. per annum, tax free, for the half year ended June 30.

PROPOSED NEW GAS-WORKS FOR ST. HELENS.

The St. Helens Corporation have for some time past been considering the advisability of erecting new gas-works. Many years ago they secured a large piece of land in Knowsley Road, with a view to ultimately building gas-works in that district. A gasholder was erected, by which it was possible to greatly improve the pressure on the Eccleston side of the borough, where it had been deficient. A few months since, it was decided that the place was unsuitable for gas-works. Several sites have since been inspected; and it was at first proposed to put the new works alongside the sanitary depôt at Parr. It has, however, now been resolved by the Works Sub-Committee to purchase land, extending to over 10 acres, at Pocket Nook, belonging to the United Alkali Company, Limited, and forming the site of Mr. Bryde's Chemical Works. The Chairman and the Gas Engineer (Mr. S. Glover) were at the same time authorized to negotiate with the Company for the purchase of such of the buildings on the land as might be of use to the Corporation. The Committee further resolved that the Town Clerk be instructed to apply to the Local Government Board for a Provisional Order amending the St. Helens Corporation Act, 1893, and subsequent Local Acts and Provisional Orders Confirmation Acts, so as to empower the Corporation to erect gas-works, to manufacture and store gas and residual products upon the lands to be acquired by them from the United Alkali Company, and to confer upon the Corporation all necessary increased borrowing and other powers with respect to the extension of their gas undertaking. The present gas-works at Warrington Road are surrounded by large factories, which render it impossible to extend further. About four years ago, a number of cottages fronting Warrington Road were pulled down, and a large retort-house built; all the available space being then taken up. The works have been in existence over half-a-century, and were purchased by the old Board of Commissioners, as from June 30, 1875, at a price of £131,600. For the past fifteen years they have been under the management of Mr. Glover. The present works will still continue manufacturing; and the new works will enable the Gas Committee to meet the constantly increasing demands. They will be situated on the Pocket Nook side of the canal, near Hardshaw Fields, and will be served by two railway companies, as well as by the canal.

STOKE-ON-TRENT GAS UNDERTAKING.

At the Quarterly Meeting of the Stoke Town Council last Thursday week, Alderman Geen, in proposing a recommendation of the Gas Committee, that a reduction of 2d. per 1000 cubic feet be allowed in respect of gas sold for motive power, gave some interesting particulars in regard to the financial position of the gas-works. He said the net result of the year's working was more satisfactory, if judged by the amount of profit made, than had been the case in any year during which the Corporation had owned the works. After meeting all expenditure upon revenue account, and providing for the interest upon loans and the annual repayment of principal, there was a net profit of £5339—the highest amount ever earned by the Corporation. Of this, £2654 had been applied towards the cost of the reconstruction of the works, which had been proceeding for some six years. He ventured to say that when the works were completed—which the Committee hoped would be during the present year—the Corporation would have a splendid property, and one that would supply the needs of the town for many years to come. They had during the past six years spent £14,623 upon reconstruction; and there were at the present time contracts in course of completion amounting to £5100, making an expenditure of £19,723. Towards this large sum the Committee had already paid out of the profits £12,292, leaving £7431 to be paid in the future. But this reconstruction, great as it was, had been made more difficult by the fact that last year one of the holders—a very old one, erected by the Company—collapsed, and they were obliged to build another at a cost of £4400. Including this holder, they would spend approximately £24,000. Having already paid £12,292 out of profits, there was left £11,831 to pay. It had been settled by the Council, almost when the reconstruction commenced, that the expense should be defrayed out of revenue. The question of the payment of the sum still to be met was one that the Committee had considered very carefully. They hoped to spread the payment over five or six or possibly more years; but it must come from the revenue. Last year when the Committee fixed the price of gas at 3s. 6d. per 1000 cubic feet, he stated that they anticipated the increased cost of coal could only be met by raising the price of gas. This had been borne out by experience. The extra cost of coal, compared with the previous year, was £3310, and they had received from the increased price of gas £3125; so that the statement he made was correct to within £185. The price of coal was now 2s. 6d. per ton lower than last year, which meant a decrease of £1750; but, on the other hand, he anticipated that they would receive £2100 less this year than last for the same quantity of residuals. He therefore suggested that the price of gas should, for another twelve months at all events, remain as at present. The recommendation of the Committee was approved.

WINDING UP THE LOUGHBOROUGH GAS COMPANY.

An Interesting Statement of the Final Accounts.

In their report on the winding up and dissolution of the Loughborough Gas Company, the Directors state that the total assets have been realized and outstanding accounts paid. The statement of account showed a balance of £4952 available for final distribution among the proprietors. This will be disposed of by the payment of £15 2s. 7½d. on each £100 of the 8 per cent. stock, and £13 4s. $9\frac{9}{16}$d. on each £100 of the 7 per cent. stock; being the same proportion on each class of stock as on the first distribution of assets, and approved by the stockholders on Oct. 12 last year. Exclusive of the payment by way of interest

(made on the first distribution of assets on Oct. 19), the present distribution will make the total amount paid to proprietors £259 2s. 7½d. for each £100 of the 8 per cent. stock, and £226 14s. 9$\frac{9}{16}$d. for each £100 of the 7 per cent. stock, which the Directors consider very satisfactory. The affairs of the Company having now been wound up and the moneys distributed, the Company is, by virtue of the Loughborough Corporation Act, 1899, section 20, dissolved.

The amounts received from the Loughborough Corporation were: For purchase of works and undertaking, £87,098; for purchase of stock of coals and other tenants' stores (at valuation), £627 15s. 9d.; interest thereon at 4 per cent. per annum from June 30 to Sept. 29, £831 2s.; in settlement of action *Loughborough Gas Company v. Loughborough Corporation*, and in settlement of all claims under arbitration award and for costs of winding up the Company, £2000; less amount due to London City and Midland Bank on June 30, 1900 (including interest and commission charged by bank), discharged by the Company out of the above proceeds of sale, &c., £5227 16s. 5d.; to amount of reserve fund realized (including interest received), £4185 16s. 1d.; less amount set aside for compensating Directors and officers of the Company, £3500; to interest on balances at bankers (made up to Sept. 30, 1901), £294 0s. 6d.—total, £86,308 17s. 11d. As to the disbursements, the costs incurred in connection with the claim made on the Corporation for items disputed by them, including costs in the above-mentioned action, £66 13s. 6d.; costs of distributing assets and of winding up the Company, viz.—Directors', Secretary's, and Auditor's salaries from June 30, 1900, to Sept. 30, 1901, £236 13s.; Parliamentary Agents' charges, £36 10s. 6d.; legal and general expenses, £192 1s. 11d.; Accountants' charges, £57 11s. 1d.; income-tax, £44 18s. 2d.; bank commission and charges, £107 10s.; amount distributed to stockholders on Oct. 19, 1900—viz., holders of consolidated 8 per cent. stock at the rate of £244 per £100 stock, £32,525 4s.; holders of consolidated or ordinary 7 per cent. stock at the rate of £213 10s. per £100 stock, £47,332 19s.; interest thereon at 4 per cent. per annum from June 30 to Sept. 29, 1900 (less tax), £756 11s. 5d.; balance for final distribution, £4952 5s. 4d. The balance-sheet provides for £3500 being set aside for compensating the Directors and officers.

FATALITY AT A GAS-WORKS IN NEWARK (N.J.).

Explosion of a Gas-Tank.

On the morning of the 25th ult., a catastrophe, resulting in the loss of six lives and injury to several employees, occurred at the works of the Essex and Hudson Gas Company, in Front Street, Newark (N.J.). It appears from a newspaper report just to hand, that on the morning in question a naphtha-gas generating tank, 30 feet in diameter and 20 feet high, was emptied for cleaning and repair. When this had been done, a manhole, about 2 feet square, in the roof was opened, to allow of the escape of any remaining gas. It is customary, before men are sent inside these tanks, to leave the manhole open for several days; and even after that period it is a rule of the Company to protect the men by attaching life-lines to them when they first descend into the tank. It is stated that, in the absence of the Superintendent of the works, somebody gave orders to have the tank cleaned at once. Accordingly, two men, named Meyer and Kirsch, entered it through the manhole; but before they reached the bottom, they were overcome, and fell unconscious. A third workmen started to follow them; but he was warned in time to retrace his steps. He shouted to Otto Neumann, the foreman, who bravely went into the tank in the hope of rescuing Meyer and Kirsch, but only to be overcome. The greatest excitement prevailed. Volunteers were called to go to the rescue of the three unfortunate men; and about a dozen willingly responded to the appeal. No one was permitted to imperil his life by entering the tank; and directions were given to procure implements to cut another opening through the roof, so as to permit the gas that remained in the tank to escape more freely. The rescuing party set to work vigorously to loosen rivets and cut through the ironwork. As one of them brought his heavy sledge-hammer down upon the head of a chisel, a spark was produced. A sheet of flame immediately burst from the opening, and a violent explosion followed—the roof of the tank being blown off, and the unfortunate workmen scattered in all directions. The news of the catastrophe spread quickly through Newark, and ambulances were hastily summoned. Investigation revealed the distressing fact that the three men who entered the tank had been asphyxiated; but their bodies had not suffered mutilation in any way. Difficulty was, however, experienced in recognizing the bodies of others; and in one case identification was quite impossible.

MANCHESTER ELECTRICITY SUPPLY.

At the Monthly Meeting of the Manchester City Council held on Wednesday last, the Electricity Committee submitted a recommendation that application should be made to the Local Government Board for borrowing powers to the extent of £477,000 for electricity purposes. The bulk of this amount—viz., £350,000—is required for extensions at the Stuart Street station; and in a report to the Committee dealing with this part of the projected work, the Engineer stated that, as the whole of the Dickinson Street and Bloom Street works, and also the first portion of 15,000-horse power of the Stuart Street plant, were fully requisitioned by existing demands and probable future requirements for current for lighting and traction purposes, it had become an immediate necessity to instal additional plant at the Stuart Street works. It was proposed to erect two sets of plant of 6000-horse power each, at an estimated cost of £350,000. This amount included the erection of ten sub-stations to cover the distribution of current for lighting and tramway purposes in various districts. It was hoped that this additional plant would be erected in time for taking up the load in the latter part of 1902. The total amount to be borrowed also included £30,000 for extensions at Dickinson Street. With a view of increasing the engine-room output at these works without adding to the existing boiler capacity, and also reducing the heavy works costs now incurred by running the existing belt-driven sets, it was proposed to replace at least four of the 400-horse power engines by two Turbo generators of 3000-horse power each, to be used for both lighting and traction. It was intended that these two additions should ultimately take the place of the eleven 400-horse power sets now installed; and it was expected that the saving in coal, oil, and wages effected by the change would amount to at least £3000 per annum. In addition, the output of the Dickinson Street engine-room would be increased by at least 1200-horse power, without having to add fresh boilers. The cost of the alterations was estimated at £30,000, *minus* the amount to be realized by the sale of the plant. A sum of £82,000 was required for the completion of Dr. Kennedy's scheme. This amount was not asked for in the last application for a loan, as the sum then submitted was a figure given by the late Engineer, which was found by Dr. Kennedy to be insufficient by £82,000. Hence the further application. The sum of £15,000 was needed for laying the necessary 3-phase traction and lighting feeders for connecting up the Denton sub-station. This amount completed the total sum necessary for finishing the cable net-work to the twenty sub-stations proposed. Dr. Bishop, in his speech proposing the adoption of the Committee's suggestion, said they were anxious to take on fresh customers; hence the need for these extensions. No fewer than 85,000 lamps were waiting connection. The new Midland Hotel proprietors had guaranteed to take not less than half-a-million units per annum; and other large concerns were waiting to be supplied. Mr. Hesketh seconded the motion, which was adopted.

ELECTRIC LIGHTING NOTES.

Last Wednesday, application was made to the Vacation Judge to appoint a Receiver and Manager of the Hampstead Electrical Supply Company, Limited. It was made on behalf of the debenture-holders; and, the Company consenting, his Lordship sanctioned the appointment for three months.

There is a prospect of the introduction of penny-in-the-slot electric meters at Lynton and Lynmouth, by which this lighting would be available for small householders. The cost of the installation of the meter would be borne by the Company; and a 16-candle lamp for four hours, or two 8-candle lamps for the same time, would cost 1d.

At a Local Government Board inquiry held at Coventry last Friday, respecting an application by the Corporation to borrow £23,000 for electric lighting purposes, the Town Clerk (Mr. L. Beard) was asked by the Inspector if the undertaking was financially successful. He replied that it was not. Questioned as to when he hoped to "turn the corner," he said the Corporation had been trying to do it for five years. The Chairman of the Electric Light Committee (Alderman Hill) added that the condition of the undertaking had been "thrown at him" for this period. The Inspector expressed his sorrow at hearing it.

Further evidence is to hand that the electric light which, after much discussion, has been introduced into Sleaford, is not regarded by all the inhabitants as "a boon and a blessing." At all events, one large firm of drapers, in the announcements they issued of their "great cheap sale" last week, gave some prominence to the fact that they burn gas, with the necessary consequence that they have "no electric lights to pay for" (resulting, presumably, in a saving in expenditure), and that there is "no bobbing up and down"—an advantage which, of course, purchasers would fully appreciate. It appears, however, from what took place at the meeting of the Urban District Council on Thursday, that more capital is required for the undertaking; and it was resolved to apply to the Local Government Board for power to raise a further sum of £1000—the £7000 already obtained having been expended.

A proposed expenditure of £27,461 on the erection and equipment of a supplemental electricity generating station at Worcester, in view of the conversion of the tramways and light railways to electric traction, provoked a breezy discussion at the meeting of the City Council on Tuesday. The proposal is to spend £7180 on the buildings, and £20,281 on the plant. Alderman Higgs protested against such an expenditure without the fullest possible information as to the necessity for, and benefits to be derived from, the scheme. He viewed with alarm the increasing number of proposals for large expenditures. Alderman J. Millington alleged that Alderman Higgs was invariably opposed to expenditures in the Council, and reminded him that the information he asked for had already been placed before the Council, which he had evidently forgotten or else missed by absence. A sharp passage of arms ensued between the two speakers; but eventually the resolution was carried.

Complaint is sometimes made that municipal accounts are kept on a system which conceals more than is revealed. This seems to be the case with regard to the accounts of the Electricity Department of the Torquay Corporation. On the faith of the published accounts of the Corporation, it was stated last week that there was a growing deficit on the working of the electric light undertaking. The accounts, as a matter of fact, show that the expenditure for the year ended March 31 last was £5089, and the income £4233; while the total deficit was £2459. It now appears that, while the expenditure for the last quarter of the year was included, no credit was given for the accounts owing for this period. The full statement of the year's business indicates that the revenue was £5742 and the expenditure £5114; leaving a net profit of £626. This amount has been applied to the reduction of the adverse balance, which now amounts to £830. An abstract of accounts which conveys so erroneous a view of the financial condition of an undertaking, is worse than useless.

According to the abstract of the accounts of the Dudley Corporation for the year ending March 31 last, the lighting branch of the electricity undertaking has not opened with a particularly brilliant flourish. The capital account of the concern shows loans amounting to £40,500; and an unexpended balance of £10,511. On the revenue account, from the commencement of the undertaking to March 31, there was an expenditure of £2843; and the income amounted to £3949, all of which had been derived from the Tramway Company, with the exception of about £30 for current to private consumers, and £173 in respect of the illumination of 18 street-lamps for 25 weeks. The balance of £1105 is

carried to the net revenue account, in which appears £253 for interest on mortgage, and £932 bankers' interest. The supply to the Tramway Company commenced in July, 1899, and the lighting supply in November, 1900. Although the lighting accounts only extend over four months, the £30 for private consumption does not indicate a violent rush of householders desiring the electric light.

An inquiry was held last Tuesday afternoon, at St. Bartholomew's Hospital, Rochester, before Mr. R. J. Stedman, Coroner, in regard to the death of James Gray, aged 33, a foreman in the service of the local Electric Light Company. Gray had to make some alterations in a sub-chamber in High Street, Chatham. He entered the manhole, and knelt on the transformer, with the object of temporarily cutting off the electric current. He had an india-rubber gauntlet on the right hand; but one of the high-tension tubes he had to remove evidently hung, and in attempting to ease it with his naked left hand he came into contact with the live cable. A fellow-workman, who was preparing to assist him, noticed that his body was stiff from the waist upwards, and that both his hands were stretched out in the direction of the fuses. He attempted to pull Gray away, with the result that he himself received a severe shock, and became partially insensible. The movement, however, freed Gray from the contact; but death took place immediately. The Jury returned a verdict of "Accidental death," and expressed the opinion that men on such work should wear gloves on both hands.

An article has appeared in the "Wakefield Express" on the subject of "Municipal Electricity," which has manifestly been inspired, with the object of bringing grist to the Corporation electricity mill. Information is given about the extensions which are being made to the generating plant; the requirement of more power being due to the fact that the increase in the number of lights has been at the rate of about 4000 a year. It is stated, without any attempt at support by actual figures derived from experience, that the successful development of the electricity works will enable the electric light to "favourably compete in cost with gas." Then it is urged, "in the interests of the ratepayers," that electricity should supersede gas in street-lighting; and it is here that we find the purpose of the article. "Why," the writer inquires, "should the rates be expended in taking light from a private Company when the Corporation can purvey the commodity from its own resources?" With a magnanimous condescension, the journalistic advocate consents "for the time being" to "all but the main streets" being "left to be lighted by gas." Then come some figures comparing the cost of high-power incandescent gas lighting and arc electric lighting. The figures for the former are hypothetical; and there is a deficiency of information on which to make a safe comparison. The writer in the "Express" perhaps does not know—nor can it be expected that he should know—anything about the methods pursued in testing the lighting value of arc lamps and gas-lights. Perhaps, too, he has not inquired into the incandescent gas lighting at the Paris Exhibition last year; nor, to come nearer home, into the high-power gas lighting at the Glasgow Exhibition this year. He has not heard perhaps that Liverpool, with its electric light undertaking, has a preference for incandescent gas lighting in the streets, and that Birmingham, Leeds, and other places, also possessors of electric lighting establishments, have been largely extending the use of incandescent gas-lamps. Why? Let the "Wakefield Express" writer inquire of the lighting authorities in those places before he again puts pen to paper on this subject.

There has been considerable agitation among the traders of West Bromwich anent the charges for electricity for lighting purposes; and at a recent meeting of the Town Council, a recommendation was made by the Electricity Committee that a flat rate of 4d. per unit should be adopted for the summer months, from April 1 to Sept. 30; and the rates of 6d. and 2d. on the maximum demand system should be continued during the winter months, from Oct. 1 to March 31. This proposal was referred back for further consideration, with a widely-expressed wish by the members of the Council that the prices should be reduced to make the use of electricity popular. After fully discussing the whole matter, the Committee came forward with a recommendation that the Council should adopt the following rates of charges: 4½d. per unit for one hour's use per day, 3d. per unit for two hours' use, 2½d. for three hours, 2¼d. for four hours, 2d. for five hours, or 4½d. per unit for maximum demand of 91 hours per quarter, and 1½d. per unit for all energy consumed above that number of hours. With regard to the lighting of churches and chapels, the Committee propose a flat rate of 3½d. per unit all the year round. The rate sanctioned in October, 1900, for electricity for power purposes was 3d. per unit until an equivalent of 78 hours' use of maximum demand had been reached in each quarter; and thereafter during the same term at the rate of 1d. per unit. The Committee proposed a uniform rate of 1d. per unit. In submitting their report at the meeting of the Corporation last Wednesday, Alderman Pitt remarked that they did not expect to make a profit for the first year or two. Though their charges were about the lowest in the kingdom, the Committee believed when they had the trams running they would make things pay. The Tramway Company, it was anticipated, would take from them altogether 600,000 units of electricity annually; and in order to supply this quantity, the present plant would have to be enlarged. The total cost of making the extensions was estimated at £1494; but the revenue from the Tramway Company would be about £4000, which would leave a balance of £2506 on the right side. A discussion ensued. The Mayor (Mr. J. H. Chesshire) considered that in connection with the undertaking there had been certain mistakes made, and that the electric lighting station had been erected 18 months too soon. They would have to face an expenditure of £2000 or £3000 before they could expect to make a profit. The Electric Lighting Committee now proposed to reduce the price by 25 per cent.; and he urged that in doing so they were making a grave mistake. He moved an amendment to the effect that the charges be for 500 units and upwards 2½d. instead of 2d. per unit; 50 units and upwards, 3d.; and below 50 units, 4d. There was no seconder, and it was urged by several members that the tradesmen, who, it was stated, were still dissatisfied with the Committee's charges, should give them a fair trial. Mr. Bushell asked if the loss on the undertaking would be within £2000 for the 18 months; but Alderman Pitt said he could not supply any information on this point until he knew the extent of the demand. Ultimately the report was adopted.

The outspoken comments of Mr. F. Brown, the late Elective Auditor, on the accounts of the Borough of Croydon, and particularly with reference to those of the Electric Lighting Department, brought down upon him the condemnation of Alderman Miller and Alderman Foss at a meeting of the Council in August last (*ante*, p. 406). Mr. Brown was not to be suppressed by their criticisms in carrying out what he conscientiously recognizes to be his duty; and therefore, at the first meeting after the recess, he attended the Council, and laid before the members a reply of considerable length. His line of argument may be suggestive in the case of other electric lighting installations, and therefore it may be useful to reproduce in full the part of the statement alluding to the Electric Lighting Department. In his first report, Mr. Brown made the remark "that nothing had been charged against the Electric Lighting Department for the clerical and other work done at the Town Hall;" and upon this Alderman Miller had something to say. Mr. Brown now deals with this and other points as follows: "This statement of mine was absolutely true; and in connection with same, section 52 of the Croydon Electric Light Provisional Order of 1891 states that the first charge on all monies received is the payment of, *inter alia*, the establishment expenses. Furthermore, I have to remark that a sum of £583 has been allowed by the Income-Tax Commissioners (true, it was fixed by the Commissioners themselves) against the profits for the clerical and other work done in the Town Hall in connection with this department. The next paragraph in my report is as follows: A sum of £7500 has been transferred from the debit of the revenue account to the credit of the general district rate account—£5385 12s. 10d. for interest, and £2114 7s. 2d. as a sinking fund. I would point out that these are arbitrary amounts. With regard to the same, I would call your attention to the fact that in the year 1898-1899, when the capital expenditure at the beginning of that year was £43,000, the sinking fund written off against profits for the year 1898-1899 was £1894 10s. 11d. Last year, with a capital expenditure at the beginning of the year of over £117,000, the amount written off for sinking fund was only £130 more. For the year ending March 25, 1900, with a capital expenditure at the beginning of the year of £88,000, the amount written off during the year for sinking fund was £2762 8s. 5d.; whereas last year, with a capital expenditure at the beginning of the time of over £117,000, or £29,000 more than the previous year, the amount written off for sinking fund was £2114 7s. 2d., or £648 1s. 3d. less. I find that the sinking fund for the present year is £4622 14s. 4d., or more than twice the amount written off during last year. Alderman Miller made the statement that, if the works had been carried on on the same lines by a company, they would have paid 5 per cent. since the starting of the works, and have a reserve of £5000. I take the average capital expenditure of each year as a basis, and find that Alderman Miller proceeds on the extraordinary assumption that no depreciation whatever has occurred. With reference to the year under review, the capital expenditure, excluding land, was at the beginning of the year £115,000. The amount written off for sinking fund—I am now speaking of legal necessities—was £2114, which in a company's books (my suppositional case which has been accepted) would be the amount of the depreciation. This works out at 1⅞ per cent. In the case of a company, besides the depreciation, they would have to consider the question, and a very serious question it is in such a science as electricity, of obsolete machinery; and I suggest, gentlemen, that a percentage of 1⅞ is ridiculously inadequate to cover depreciation and the risk of machinery becoming obsolete." There was no remark upon this statement; discussion being reserved until after the Finance Committee have had time to digest the matters referred to, and to report the result to the Council.

Darlington Water Supply.—At the meeting of the Darlington Town Council last Thursday, Mr. Stairmand stated that the water supply of the town was adequate, and in excellent condition. The profit for the year ending June was shown to be £2649. It was recommended that the sum of £50,000 be borrowed, if a Provisional Order could be obtained, for water-works extension.

The Opening of Roads in the Metropolis.—The following notice of motion by Mr. G. Foster stands upon the *agenda* for the meeting of the London County Council to-day: "That, in consequence of the growing evil, resulting in loss of life and injuries to persons, damage to business, and danger and delay to vehicular traffic, caused by the frequent and continuous opening of roads, it be referred to the Highways Committee to consider and report as to the best means for the Council to procure such statutory powers as to secure that all persons or companies having parliamentary powers to open the roads shall be compelled to give adequate notice to the Council before exercising such powers; and that the Council shall have the power to make such regulations and have such supervision as will insure such work being done expeditiously, and with full regard to the public safety and business interests."

A New Reservoir for Swansea.—On Tuesday last, the Mayor of Swansea laid the foundation stone of the dam which is to be constructed in the Cray gathering ground, for the purpose of storing water for the supply of the town. The work, which was originally sanctioned in 1892, was commenced in 1898; but a few months ago a conflict with the Contractors resulted in the Corporation taking it over. The reservoir will be formed by a masonry dam impounding a depth of 100 feet of water. The greatest height from the foundation stone to the high-water mark will be about 130 feet; and from the foundation to the top of the dam, 137 feet. The length of the dam will be about 1340 feet. The reservoir will have a capacity of 1000 million gallons. The overflow from the reservoir will pass through a series of arches, and down the back of the wall into the River Cray. The length of the reservoir is about 1¼ miles, the area of the top-water level 100 acres, and the area of the gathering ground 2680 acres. The water from the reservoir will pass through the Bwlch tunnel, 2¾ miles long, and 2¾ miles of 12-inch cast-iron main, finally emerging at the Town Hill reservoir (now in course of construction) at a level of 580 feet, which is high enough to supply the highest levels of Swansea. The rainfall is heavy; but the observations have not extended over a sufficient period of time to establish it with accuracy. As much, however, as 5 inches has been known to fall in 24 hours at the Bwlch Siding.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, St. Helen's Place, Bishopsgate Street, last Thursday, under the presidency of Colonel A. R. M. LOCKWOOD, M.P.

The SECRETARY (Mr. I. A. Crookenden) having read the notice of meeting, and other formal business having been disposed of,

The CHAIRMAN proposed the adoption of the report and accounts (which were briefly noticed in the "JOURNAL" last week, p. 861), and the payment of a dividend at the rate of 7 per cent. per annum, less income-tax, on the ordinary stock, for the half year to Midsummer. He said the Directors looked upon the state of the Company's affairs as very satisfactory—certainly up to the date when the accounts under review were closed. For instance, the increase of water-rates, as compared with the corresponding period of last year, amounted to £9685—the largest advance, he believed, which the Company had had for any similar period. While it must be borne in mind that their income from water was largely affected by the state of trade—for they had some very extensive trade supplies—yet it was gratifying to know that the fixed charges for domestic services were upon the increase. Thus the income per house from those brought into charge during the half year amounted to £1 5s. 10¾d., against £1 4s. 3¾d. for the corresponding period of 1900, and £1 3s. 8d. for the half year ended Midsummer, 1899. The average all over per house was, too, on the increase, amounting now to about £1 3s., against a fraction over £1 at which it stood for a long time. These appeared to be small differences; but they amounted to a great deal in a district like theirs, where they had no fewer than 213,948 supplies. The result showed growth, not only in numbers, but also in values. Passing to the revenue account, he stated that the total maintenance charges had increased by nearly £6000; the principal item being "pumping and engine charges, including the cost of coals, wages, &c." This was accounted for by increased consumption and the higher price of coal. Wages, too, had risen to a certain extent. "Abstraction of water" was greater, by reason of the increased payment to the Lea Conservancy Board under the Lea Conservancy Act, 1900; and an item of £1000 had also been debited under this heading on account of liabilities for water purchased up to the end of June. Then, again, rates and taxes were £3000 higher; but this did not mean entirely an increase of the Company's local burdens. Some of the amount was in suspense at the corresponding period of 1900, owing to the difficulty arising through the failure of some of the parishes to give a decision upon the Company's appeals against the assessments. On the other hand, there were items in which decreases appeared—such as maintenance and repair of mains, &c., £500; filtration, £400; and salaries of engineers, &c., part of which had, owing to the great extension of works, with the assent of the Official Auditor, been debited to capital. With respect to the items under management, most of them were unaffected relatively. In the general establishment charges, there was a difference of £1200. This arose from an item of £750 for workmen's clothing being brought into this account, when it was previously charged under a different heading in maintenance; while law and surveyors' charges included sums paid for a special investigation of the geological condition of the gathering ground of the water. As regarded the credit side of the account, the increase of water-rates, as he had already said, was very satisfactory; while the bad debts were but a fraction higher than for the corresponding period of 1900, although there had been a very much larger rental to collect. He thought that, on the whole, the accounts might be regarded as very satisfactory. He ought, perhaps, to add "as far as they go," because the balance of £29,639 which the Directors proposed to carry over to the next account would be—indeed, had been—materially drawn upon for the purchase of water from the New River and some of the Thames Companies. He was unable at the moment to state the exact figure, for the charge had not yet been finally decided upon; but he congratulated the proprietors on having such an unappropriated balance. It was, he thought, the largest they had had for many years; and it would be more than sufficient to meet any possible claims arising by reason of the drought. The absence of rainfall had been almost as bad as ever; and it did not yet appear that the season of drought was over. He thought he was justified in expressing a feeling of pride that, despite the abnormal—one might say, unprecedented—drought, the Company had furnished their district with a constant supply throughout the whole period; and the high pressures had been fully maintained. This had been their policy throughout. The statutory obligations on their part had been faithfully observed, and the rights and convenience of the consumers studied before any and every other consideration. A carefully-engineered public outcry was raised against the Company at the time when they were compelled by droughts to limit the supply to the consumers; and the advantages of corporation management were pointed out to the ratepayers of the Metropolis. But he should like for a moment to show how the forces of Nature were sometimes victorious even over corporations in charge of water supply. The Company had been accused over and over again of stinting their consumers in order to raise the dividends, of increasing chances of disease among the poor of the East-end, and of allowing the flowers in their window-boxes to perish. When the Company prosecuted those who, during a severe drought, flooded their back gardens to give their ducks a swim, or who left their taps running all night, they were styled "autocratic water lords" and "swindlers of the ratepayers." Let them look at the state of affairs just now in the Provinces, of which little was heard beyond a few newspaper paragraphs. Manchester, with Thirlmere at its back, had been compelled to shut down the service for 12 out of the 24 hours; Leeds and Bradford were rapidly getting to the end of their stock; and at Huddersfield and Halifax the situation was equally grave. On Wednesday, Sept. 25, nearly 1000 miners were idle owing to the Wheat Sheaf Collieries of Messrs. Andrew Knowles, at Pendlebury, being unable to work in consequence of the failure of the water supply. At Middlewich, Cheshire, the supply was only available for three hours daily, and sometimes less. He sympathized with all these districts; but if one tithe of this distress for want of water had fallen upon London, let them imagine what indignant paragraphs would have appeared in a certain portion of the Press, what public meetings would have been held, and how Mr. Fellowes, Mr. Bartley, and himself would have been held up to scorn in the House of Commons as guinea-pig directors, fattening on their fees, while the labourer in the East-end had no water to wash in. Of course, the system of intercommunication instituted by the Government under their Act of 1899 had enabled the Company to secure the water that was needed in an emergency. The Company, however, attempted to effect the same object in more than one of their Bills in Parliament; but they were always vigorously opposed by the London County Council. The Government, however, appreciated the importance of treating the London Water Supply as a whole, and of seeing that no section of the community should have more water than they could possibly use while another section had to run short; and this provision it was that had enabled all inconvenience of an otherwise short supply to be avoided. Regarding the large extensions of plant and reservoirs, the Directors thought that the progress and character of the work were perfectly satisfactory. The additional 1200 million gallons which the reservoirs under the Act of 1897 would hold would constitute a very important reserve force in the future. Land had been purchased, and complete surveys would shortly be instituted and plans and specifications prepared by Mr. Bryan and his staff, for the large extensions under the East London Water Act of last year. When these additional reservoirs were finished, the Company would be put, should they then be in existence, beyond all doubt as to sources of supply; while if they should be taken over, the works would constitute a valuable legacy to their successors—a fact which must not be lost sight of. All the machinery and plant, and the works generally, were kept up to their usual state of efficiency. At their meeting on the 4th of April last, he stated that the Purchase Bill introduced by the London County Council had been rejected, and that the Government had announced their intention of introducing a measure for acquiring by a Water Trust the undertakings of the Metropolitan Water Companies. He assumed that this intention would be duly carried out, and that they might expect in the near future to be in possession of the terms. As to the formation of the Water Trust, he acknowledged that the political movement started with a view to confiscate private property for County Council purposes practically compelled the Government to bring in such a measure; but he did not believe that public management would result in a decreased price of water to the ratepayers, while he thought it was extremely likely that some day a Government would make an attempt to supply with water free in their houses the classes who worked with their hands, at the expense of the classes who worked with their heads. He had no reason to suppose that the proposed measure of the Government would be in any way inimical to the interests of the shareholders, as the report of Lord Llandaff's Commission stated that the Water Companies had discharged their responsibilities fairly well, and in somes cases very well. As far as the East London Company were concerned, some of the trials they had passed through would have been avoided had they not been opposed session after session when their Bills had been introduced. He thought, however, it might be assumed that all the Companies would be fairly and equitably treated. The shareholders might certainly rely upon this—that, as the Directors had in the past conscientiously studied in every way the interests of the consumers, so they would, without in any way departing from that obligation, keenly and carefully consider the interests and rights of the shareholders in the future, and be fully prepared to fight, if necessary, for the maintenance of those rights.

Mr. G. BANBURY seconded the motion.

Mr. NEWBY said they must all deplore the drought in the North of England; but he did not think that the comparisons made by the Chairman as between their Company and the towns mentioned were fair. He hoped that in the Act by which their property would be taken over the position of the holders of the old debentures, who paid no income-tax upon them, would be provided for. He considered it most unfair that just when the Company had got into their present position the concern should be taken away from them. He felt sure that the people of London would have to pay smartly for their water when the supply was managed by others.

The CHAIRMAN, in reply, said he agreed that it was very unfortunate that their property was to be taken over just when they had weathered their difficulties, and they saw that they had a business which showed every prospect of increasing dividends. He thought that private enterprise would be stopped a great deal when it was realized that directly it began to pay it might be taken out of the hands of those who had originally gone into it. Unfortunately, however, it was a matter over which the Directors had no power. They would certainly use their best endeavours to see that the interests of the proprietors were safeguarded in every possible way.

The motion was unanimously adopted.

The CHAIRMAN, in acknowledging a vote of thanks, stated that but for the zealous services of Mr. Bryan and Mr. Crookenden in their different departments, the Directors would not have been able to carry on the business as well as they had done, though his colleagues and himself had given to it every attention in their power.

The proceedings then terminated.

BELFAST WATER SUPPLY.

The First Instalment of the Mourne Extension Scheme.

An interesting ceremony was performed last Wednesday afternoon, when the new water supply for Belfast which has been procured from the Mourne Mountains, County Down, was formally turned into the Knockbreckan reservoir by Sir Robert McConnell, Bart., who has taken a prominent part in the promotion of the scheme. A large party of representative members of various public bodies and well-known citizens of Belfast assembled at the Water Office at one o'clock, and drove to the new reservoir, which is situate near the Saintfield Road, about five miles from the city. The afternoon was beautifully fine, and the inspection of the new works was carried out under very favourable auspices. The following particulars in regard to the scheme were

supplied to the "Belfast News Letter" by Mr. L. L. Macassey, M.Inst.C.E., the Chief Engineering Adviser to the Water Commissioners:

The aqueduct which conveys the water from the gathering-ground to the service reservoir just brought into use is about 35 miles in length. In ordinary level ground, the cut-and-cover mode of construction has been adopted. Through mountains, tunnels have been driven, and valleys have been crossed by means of dips formed of steel or cast-iron pipes. The former have been employed where the pressure is greatest—in some cases reaching 400 feet of head. The following figures give the relative lengths of the different modes of construction: Cut-and-cover, 16 miles; tunnels, 7 miles; and steel and cast-iron pipes, 12 miles. The longest tunnel is that which passes under the high ground near Knockbreckan. This is about 3½ miles in length, and is principally through rock. Driving was carried on from several working shafts, and the net section is 6 feet square where lining has been adopted; the heading being 8 ft. 6 in. square. The next most important tunnel is that under Slieve Donard, near Newcastle. This is about 2¼ miles in length, and it was worked from the ends and one shaft near the Glen River. The material passed through was granite and indurated silurian rock; the latter being the most obstinate to penetrate, Drills actuated by compressed air were employed to pierce the rock to form holes for blasting purposes. The rate of driving varied very much, and in some of the harder beds the advance did not exceed one yard per day at a face. The whole tunnel was driven in about 3½ years; which averages slightly under two-thirds of a mile driven per annum, with four faces working most of the time. In the cut-and-cover portion of the aqueduct, cement concrete was the material of construction employed. All the stone and a great deal of the sand used was obtained on the line of works. One matter required special attention during the design and construction of the aqueduct, and that was the adjustment of the levels. The pipe-dips are laid to a working hydraulic gradient of 5 feet per mile, which in a 36-inch main gives a flow of something over 10 million gallons per day. In the lengths of cut-and-cover, the inclination is 1½ feet per mile; while in the tunnels it is 1 foot to the mile.

Coming towards Belfast, the work next requiring notice is the service reservoir at Knockbreckan. This is formed with earth and puddle banks on two sides; the other boundaries being the natural ground. The main bank is about 60 feet at the deepest place, and the water surface is generally square in form—making up 17½ acres; and the capacity is about 100 million gallons. The service reservoir maintains a steady pressure on the district of supply; but it also has sufficient water in store to keep up the supply when repairs are requisite on the aqueduct. Hence the latter could be thrown out of use for a week without interfering with the supply to the city. From the Knockbreckan reservoir to Belfast the connection is by means of cast-iron pipes, 36 inches in diameter, right into Ballymacarrett; but at one portion of the line the main is laid double in mild steel pipes. Here there is a very deep cutting, and the Commissioners adopted the policy of laying the second line of main at once; and in order to reduce to a minimum the likelihood of repair, and sinking down again through the deep cutting, steel was adopted instead of cast iron. The 36-inch main terminates on the County Down side of the river; but eventually a continuation of this line will require to be carried into the County Antrim portion of the city. Meantime a new system of mains is being laid down through Ballymacarrett and the adjacent suburbs, and the new water will be distributed through these mains, and a certain amount will be passed over the bridges through the existing pipes. It must not be understood from the foregoing that the new system of works is complete, or anything like it. The two reservoirs are still on paper, and no commencement has been made beyond sinking trial.

The position of the works is shortly as follows: From Belfast to the Annalong Valley the aqueduct and service reservoir, with the auxiliary works, are capable of passing water; but south of the Annalong River the works of the aqueduct are incomplete. A temporary cut has been made from the river to the aqueduct, and the flow of the stream passed in for use in the city. The water from the Kilkeel River is not yet available. It is hoped, however, that in a few months the southern portion of the aqueduct will be so far complete that that river can be laid under contribution. For about seven months of the year the rivers will furnish some 10 million gallons of water per day, which, as already pointed out, is the capacity of the single 36-inch main already laid down. During the other five months, the supply will run down as low as 2 million gallons per day from both rivers. The mode of working the combined old and new supplies for the use of the city until at least one reservoir is built will be as follows: For the seven months the Mourne water to the extent of ten million gallons per day will supply about three-fourths of the population, and the existing supplies will be drawn upon for the use of the rest of the consumers. The two waters, however, will be mixed. By this arrangement the existing reservoirs at Woodburn and Stoneyford can be filled during the winter, and kept full till a later date than at present, and (what is of great importance) the water allowed to flow into certain of the existing reservoirs can be selected. In other words, a good deal of undesirable flood water can be rejected, and, if used at all, can be allowed to settle in store for a much longer period. In the matter of estimates, the Commissioners have been a little unfortunate, for they had to place a number of ironwork contracts at the time prices were 50 per cent. above the average. The rapid growth of the demand for water in the city compelled them to go on even with a rising market. For the Silent Valley reservoir aqueduct, with one line of conduit main, service reservoir, and a single 36-inch main into the city, the expenditure will reach about £950,000. When, however, a second reservoir is built, and a further line of conduit main laid down, the outlay will reach about £1,250,000 in all.

From the commencement of the scheme till the present time Mr. Macassey has been the Chief Engineering Adviser to the Commissioners, while Mr. F. W. M'Cullough, M.Inst.C.E., was Resident Engineer during the preliminary surveys and laying out of the works. Mr. L. M. Bell, Assoc.M.Inst.C.E., was Resident Engineer for the greater portion of the period of construction. As regards the contracts, the largest of these were placed in the hands of Messrs. Fisher and Le Fanu, of Dublin; Messrs. H. & J. Martin, of Belfast; Messrs. John Paterson and Sons, of Glasgow; and Messrs. Henry Laverty and Son, of Belfast. The cast-iron pipes were supplied by Mr. D. Y. Stewart and Messrs. R. Laidlaw and Son, Limited, of Glasgow; also by the Stanton Iron-Works Company, Limited, of Nottingham. Steel pipes came from Middlesbrough and the Steel Company of Scotland, Limited, but they were all rolled and made up by Messrs. Piggott and Co., of Birmingham; and all the automatic valves, gearing, and special fittings, of which there were a large number, came from the Glenfield and Kennedy Works, Kilmarnock.

On the arrival of the party at the upper end of the reservoir, where the supply comes in from the conduit, Mr. William Ross, Chairman of the Board of Water Commissioners, expressed the pleasure it gave those present to see Sir Robert M'Connell with them that day for the purpose of formally opening the reservoir. Mr. John Fisher (of Messrs. Fisher and Le Fanu) then handed to him a handsome silver "loving cup," as a souvenir of the occasion. It was an exact reproduction of the famous Cashel cup, with three handles, in the spaces between which were the arms of the Commissioners, and those of Sir Robert; the third space being occupied with the inscription. Sir Robert briefly thanked Mr. Ross and Mr. Fisher for their kind remarks in offering the very beautiful and appropriate gift; and the Lord Mayor (Sir Daniel Dixon, D.L.) having tasted the water, and pronounced it excellent, the party proceeded to the standpipe, where Sir Robert performed the ceremony of turning on the water, Mr. W. Kerr (Chairman of the Works Committee), and Mr. J. Martin having first directed the attention of the Company to the importance of the scheme to the city of Belfast. Mr. Martin also presented Sir Robert M'Connell with a handsome golden key, commemorative of the occasion. It had a shamrock top, with the full arms of Sir Robert in the centre, coming out in true heraldic colours, with the motto, "Victor in arduis." The reverse bore the following inscription: "Presented to Sir Robert M'Connell, Bart., D.L., by Messrs. H. & J. Martin, Limited, Contractors, on the occasion of his turning on the water supply from Mourne Mountains to Belfast, 2nd October, 1901." The gift having been acknowledged in cordial terms, the ceremony concluded, and the party proceeded to a handsome marquee, where luncheon was served under the presidency of Mr. Macassey.

THE PROPOSED NEW WATER-WORKS FOR TEIGNMOUTH.

A Meeting of the ratepayers of Teignmouth was held yesterday week, to consider the proposal of the District Council to promote a Bill in the next session of Parliament for the provision of a gravitation scheme of water supply. Colonel Morrison, Chairman of the Council, who presided, moved a resolution authorizing the scheme. He said the water difficulty had existed for twenty years; and that through the need of an adequate supply, the town was getting a bad name. The scheme now proposed, for obtaining water from the Hyner Valley of Dartmoor, would give them a plentiful supply for all time, and in the end would be the cheapest and best. If they went to Torquay or Paignton for a supply, they would be always paying, and would never have a water property of their own. Mr. Harris, Chairman of the Water Committee, dwelt upon the importance of the town having a constant supply of water. During the summer, the water had been cut off every day at 1 o'clock in the afternoon; and, in consequence, the town got a bad reputation among visitors. Mr. C. Jones, the Surveyor, read a report by Mr. W. A. Ussher, F.G.S., on the possibility of augmenting the water supply from sources near the town; and, in reply to questions, he said the Hyner works would be their own as soon as completed, but it would take sixty years to pay off the debt. The scheme could be carried out to satisfy present wants for £60,000. There was no necessity for filtration; the water being above suspicion. A rate of 3s. 8d. in the pound would cover the whole outlay. Details of the cost of the scheme could not be given at present. The existing debt on the waterworks was £16,000; and this would be paid off by 1934. The Rev. Anson Cartwright, a member of the District Council, supported the scheme, and contended that tinkering with the question in the past had resulted in the piling up of a big debt, without any adequate addition to the supply. It was necessary to have a good supply, in order to enable them to abandon the use of Coombe Brook—a source which was open to grave suspicion, and might lead to a serious outbreak of disease. Mr. Furler and Mr. Banbury, also members of the Council, opposed the scheme. Mr. Furler said it would cost £120,000; and Mr. Banbury predicted that it would add 5s. to the present rates of 8s. 6d. in the pound, while they could get all the water they wanted from Paignton for 1s. 5d. in the pound. Dr. Piggott, the Medical Officer of Health, supported the proposal, and said that Coombe Brook, which had been condemned time after time since 1871, must be abandoned. Mr. J. Morrison reminded the meeting that two or three years ago, when a new reservoir was opened, they were told the water question was settled for twenty years. Having this fact in view, the ratepayers were sceptical as to the present promises of the Council. The resolution was put and rejected by a large majority; and the meeting, which had been very disorderly at times, came to an end. A poll of the town is to be taken.

The Care and Use of Petroleum Lamps.—The Board of Education have issued the following circular to school managers, enclosing a list of suggestions for the care and use of petroleum lamps: "The frequency of accidents with petroleum lamps in dwelling-houses, causing not only damage to property, but great physical suffering and even loss of life, has led the authorities of the Home Office to an investigation which has resulted in their drawing up a number of suggestions for the care and use of petroleum lamps. It is said that almost every accident which has occurred with a petroleum lamp has been due to the neglect of one or other of the precautions suggested. The Board of Education think that if the necessity of these precautions were impressed upon the older scholars in elementary schools by means of object lessons on petroleum lamps or otherwise, as the managers and teachers may find best, there would be a great reduction in the number of these lamentable accidents."

THE DROUGHT IN THE NORTH OF ENGLAND.

A Welcome Break.

The drought which has for so many weeks affected Lancashire, Yorkshire, and some parts of Durham, was broken last Tuesday, when rain fell copiously for several hours; while the condition of the atmosphere and the appearance of the skies gave promise of a further downfall. Never was rain more heartily welcomed, especially in Manchester and the district, which has suffered severely. Now that some relief has come, it may be of interest to place on record the recent position of affairs in some of the more important towns affected.

In Manchester, the quantity of water in store when the rain came was equal to about 23 days' requirements. At the meeting of the City Council on Wednesday, the Chairman of the Water Committee (Sir John Harwood) stated that they had passed through four exceptional months, during which they had only had 8⅓ inches of rain. Generally, during these months, 18 inches of rain fell. He was told that morning that there had been a rainfall of an inch on the preceding day; but he would remind the Council that if the land was dry no water would find its way into the reservoirs. He was very glad that the arrangements the Committee had made to prevent a water famine had been appreciated by the public. Replying to complaints about the quality of the water, Sir John stated that a great quantity of moss was growing in the mains. In some places it was 3 inches thick. Two years ago, when the pipes were cleaned, 700 tons of moss, shells, and other things were taken out. Referring to the conveyance of the water from Thirlmere, Sir John said that the question was often asked why, when the Water Department laid the Thirlmere pipe, they did not put down two; and now that they were about to lay the second, people asked why they did not lay the third. He would answer those fair questions in the kind and candid manner in which they were put. In order to do so, he would have to recall the conditions which obtained in 1878-9 and on till 1885; and he thought when he had done this there would be no astonishment that two pipes had not been laid, but rather that the Council had the courage to put down any at all. The necessary powers were obtained in 1879, and at that time there was no unanimous desire that the Bill should be obtained—indeed, there was a formidable opposition to it. From 1879 to 1885 there was stagnation in trade, and in that period there was no increase in the consumption of water. If they had gone on with the development of the scheme at this time, they would have had to find £110,000 a year for interest on the outlay, and there would have been no revenue. They held their hand; and he contended they acted wisely in doing so. It was only justice to say that the extra pipe from Thirlmere, about which so much had been said, would not have been wanted until last month but one. It would have cost £20,000 a year, and it would have been lying useless in the ground all these years Then there were people who said, "While you are putting down No. 2 pipe, why not put down No. 3?" He would try to explain. Some 2½ years since, it was thought desirable to make preparations for the laying of a second pipe; but there came a boom in the iron market. In May of last year, they decided to ask the Council for authority to begin the work. But because of the boom they deferred matters till Christmas; and the net result of waiting six months represented a difference—a saving—of £80,000 between the prices to be paid for pipes. The fact was that they were really in a tight place with regard to the pipe question. As far as the Water Committee were concerned, they were doing everything that was possible, and doing it as expeditiously as they could. The Council might ask whether there were any suggestions to make. There was one. A suggestion was put forward by Mr. Bateman some years ago that a certain reservoir at Longdendale should be raised 5 feet, and thus give them some millions more gallons of water. At that time, however, there was a scare arising out of a terrible flood at Holmfirth, and they held their hand. Their Engineer had since gone into the question very carefully; and he had just advised that this particular reservoir should be raised to the extent named. If they could do this, they would have a greatly augmented supply. The present pipe brought 10 million gallons a distance of 30 miles, and it then lost about 1½ million gallons. How this leakage occurred, the Committee were unable to discover, though the tests were frequent. It was intended that the new 44-inch pipe should bring 12 million gallons daily; thus giving them a supply from Thirlmere of 20 millions per day. On Thursday night, rain fell to the extent of nearly half-an-inch at Longdendale; the result being an increase of 21 million gallons to the water in stock, bringing it up to 647 million gallons. Thursday's consumption was 24,809,092 gallons; leaving a quantity equal to 21 days' supply, after making allowance for the compensation water.

On Monday morning last week, the water for trade purposes was stopped at Huddersfield, and consequently all mills and works depending upon the Corporation supply had to close. This was not so bad as might appear to outsiders, as many mills have reservoirs of their own, or dams, or "lodges," as they are called, and would be able to go on for some time. Still, great inconvenience, loss, and some suffering followed the step. The great reservoir at Blackmoor Foot presented an appearance such as it had never had since it was first filled. Only fourteen days' supply was in store, and only eight days' in high-level districts. All private sources were laid under contribution. Water was supplied for domestic purposes only for six hours in the daytime. The water area extends a considerable distance outside the town on all sides, and neighbouring authorities had hitherto been helped; but all such help had been withdrawn, and the strongest restrictions were being enforced. At a meeting of the Water Committee held on Friday, a further restriction was agreed upon. On and after last Sunday morning, the domestic supply would be curtailed over the whole of the area by two hours; the service being from 8 a.m. till noon. No information was available as to how the recent rains had affected the reservoirs; but the Chairman of the Committee (Alderman Hirst) threw out the hint that possibly the supply might have to be reduced to two hours per diem. A local firm of brewers (Messrs. Bentley and Shaw) arranged to supply the inhabitants of the Lockwood district with water for drinking and culinary purposes, for the trouble of fetching it, between three and four in the afternoon. The firm have an unfailing supply of good water; and their offer was freely accepted.

Halifax at the commencement of last week had less than twenty days supply of water for the town and the surrounding districts. The reservoirs have a total capacity of 1340 million gallons, and in May last they were full. The rainfall of this year, however, is less by 8·58 inches than that of last year; so that the town's stock of water was less than 170 million gallons, quite half of which it was estimated would be unfit for public use, owing to silt and other accumulations at the bottoms of the reservoirs. In 1887, the nearest approach to the present year, the Water Committee cut off the supply from 8 p.m. to 5 a.m., when there were 589 million gallons on hand; and a further restriction was imposed when the quantity had been reduced to 366 millions. The present Water Committee did not take any steps in this direction till the 22nd ult., when the water stored was only 216 million gallons. On that day they shut off the supply from 7 p.m. to 5 a.m., and reduced this by another two hours from the 27th. Things were reaching a crisis when early last Wednesday morning a heavy rainstorm, passing over the reservoirs, increased the stock of water therein some 6 million gallons—nearly sufficient to provide the borough and surrounding districts for one day. The total storage was on that day 163,025,000 gallons, against 569,920,000 gallons on the corresponding day of last year. Another heavy downpour occurred at night. There was a further fall on Friday morning; but the reservoirs did not benefit to any appreciable extent—the quantity of water in store on that day being 156,187,000 gallons. The Water Committee resolved, at a special meeting held in the afternoon, that if the water in store continued to diminish, the supply to consumers would, as from yesterday, be shut off daily from 6 p.m. to 6 a.m.

The Batley Corporation found themselves compelled, on Monday last week, to apply to Morley for assistance; but they were informed that no arrangement could be made for a supply of water. The Town Council met in the evening to consider the situation; and it was decided that after the next day no water should be supplied to the mills or any trade consumers, and that the domestic supply should be restricted to six hours a day—from seven in the morning till one in the afternoon. The following day, however, the Chairman of the Water Committee (Alderman J. W. Blackburn), on his own authority, consented to three or four firms, one being that of the Mayor, having a supply of water for trade purposes. This action was the subject of much controversy at the meeting of the Town Council on Thursday; and the permission was subsequently withdrawn. At the conclusion of the business, a private meeting of the General Purposes Committee was held, when the question was again dealt with. There was great turbulence, and the Mayor made no secret of the fact that he felt greatly aggrieved at what he considered a veiled attack upon himself, while Mr. Akeroyd, who had brought the matter forward, felt equally offended at what had occurred, with the result that both expressed their determination to resign. The meeting abruptly terminated, without anything further being done. The stoppage of the mill supplies left at the close of last week a stock of water sufficient for domestic consumption for another sixteen days. Water was sold in the town at 1d. per bucket. Dewsbury was in a sad predicament owing to the shortness of water; and, to add to their difficulties, a main burst on Dewsbury Moor, which necessitated cutting off both domestic and trade supplies.

On the night of the 30th of September, the depth of water in the Watersheddles reservoir at Keighley had fallen to 15 ft. 6 in.—a reduction of 18 inches since the previous Thursday. The decision of the Water Committee to limit the hours of supply was in operation; but the turning off and on of the water had a prejudicial effect on the valves, and leaks occurred in many parts of the town. On Wednesday, however, the condition of the reservoir was a little more favourable, the water level at five p.m. being 7 inches higher than it was on the previous day. This was largely due to a brief but heavy downpour of rain which occurred shortly before midnight on Tuesday. On Thursday night nearly half-an-inch of rain fell; and the level of water in the reservoir on Friday morning was 5 inches higher than it was on the previous day.

Some extraordinary scenes have lately been witnessed at Nelson, as the result of the prolonged drought. Anticipating the exhaustion of the water in the compensation reservoir for the Walverden stream, several owners of mills and workshops had either placed weirs in the stream or elevated those already constructed there. In this way the stream had been practically converted into a series of reservoirs. When the water was turned on at the compensation reservoir at four a.m., the first stream reservoir would not overflow until about 6.30; the next would detain the water for a further period; and through other detentions the day would be well advanced before work could be commenced in the factories and workshops on the lower banks of the stream. The result of this was that, while the operatives at the higher mills lost little work, those of the lower ones did not have much employment. The consequence was that on the morning of the 28th ult., about ten o'clock, some 12,000 looms and other machinery had not commenced running, and it was quite clear that the patience of the operatives at the lower mills had become exhausted. Several hundreds of them, equipped with spades, crowbars, hammers, and other implements, and some of them wearing leggings, went to the second dam and quickly broke it down. They were accompanied by a vast crowd of sympathetic workpeople, who cheered them in the work of destruction. The mill there was soon brought to a standstill, as the water, released by the removal of the weir, quickly ran down the dry bed of the stream. In like manner, other dams were attacked. On Monday, Nelson was in a state of great commotion. Large crowds of operatives, unemployed through the drought, paraded the streets and hooted some millowners. Other crowds broke down a river dam, and completed the demolition of certain weirs partially destroyed on Saturday. Conflicts between the attacking party and some operatives employed at the mills where dams were, led to several of the latter being thrown into the stream. At the Town Hall a deputation requested an interview with the Mayor; but his Worship was not on the premises. However, it was decided by the Town Clerk to call a meeting of the Water Committee of the Council in the evening, to have a conference with the riparian owners, and, if possible, come to an understanding by which the whole of the mills on the banks of the stream could be at work for a certain number of hours daily. The outcome of the conference was that a notice was issued by the Town Clerk (Mr.

J. H. Baldwick) to the effect that arrangements had been made with the Corporation which would, as far as possible, enable every mill to obtain a fair share of the water available, and that there was, therefore, no reason or justification for interference with the weirs or works upon the stream. It was added that the police had instructions to prevent damage being done. It was believed that the notice would have the effect of preventing a renewal of the disturbances. The arrangement with the millowners was that a dam should be constructed at each mill, the weirs to be water-tight, so that each dam should be kept full. In this way the water going into the stream would flow into all the dams in succession. Owing to a fall of 0·25 inch of rain on Monday night last week, mills were kept running during the greater part of Tuesday, in the evening of which day the service reservoir contained ten days' supply of water for domestic consumption, calculated on a daily service of eight hours.

The prolonged scarcity of water has caused extraordinary distress in North-West Durham. Many collieries were unable to work because the water for manufacturing purposes was stopped some time ago, and hundreds of iron and steel workers were paid off by the closing of the Consett Iron Company's works. The Urban District Council obtained water in small quantities from neighbouring springs, and delivered it to householders to meet immediate domestic requirements.

The Stalybridge, Dukinfield, and Mossley Joint Water-Works Committee have for several weeks enforced measures of economy in the use of water. Two of the reservoirs were empty last week; and the others were falling rapidly. The storage was only 231,832,000 gallons, or 309,976,000 gallons less than it was this time last year.

As far as Heywood is concerned, the recent rains did not afford much relief; and last Wednesday the water in the two reservoirs was down 24 feet and 16 feet respectively. The total quantity was not more than sufficient for fifteen days.

Mr. T. Bower, the Engineer and General Manager of the Hartlepools Gas and Water Company, told a representative last Tuesday that the soft-water reservoirs at Hurworth Burn and Hart were empty, but that there was in the hard-water supply an excess of something like 50 per cent. over and above the requirements for domestic purposes, and this was accordingly being turned to commercial uses. He expressed satisfaction at the response which had been made to the notice requesting the avoidance of waste, and trusted consumers would continue to be careful in the use of water.

The drought has brought to light a somewhat curious spectacle near Bolton. At Turton, the Bolton Corporation's reservoir has been rapidly drying up, and now the roofs and chimneys of houses are to be seen above the water. The reservoir was formed in a natural valley; and it is reported that the people inhabiting the houses therein refused to leave until they were absolutely compelled to do so by the water. This is the first time that the houses have been seen since they were submerged.

At the close of the monthly meeting of the Bury and District Joint Water Board on Thursday, the Chairman (Alderman C. Brierley) stated that the quantity of water in store in the reservoirs was, under normal conditions, equal to not more than 12 days' supply. He appealed to all consumers to exercise the utmost economy in the use of water; and stated that wasters would be prosecuted. The Board, he said, had done, and were still doing, all they possibly could to keep up the supply for domestic consumption, not only by obtaining water from private sources, but also in restricting the supply to trade consumers.

At Bradford the supply has been restricted; but the step has not yet been considered necessary at Leeds, where at the close of last week there was in store enough water for eighteen days.

Incandescent Gas-Lighting in Birkdale.—The lamps in the principal thoroughfares of Birkdale (Southport) are being fitted with incandescent burners. Four dozen of them are being placed in Bray's lamps as an experiment, prior to the general adoption of the incandescent system for public lighting throughout the town. The first instalment of the new burners was put up last week, and a great improvement in the lighting was the result.

London Water Companies' Profits.—According to a return, issued last week, of the accounts of the London Water Companies for the year ending Sept. 30 and Dec. 31, 1900, the profits realized by the Companies were as follows: Chelsea, £90,012 10s. 5d.; East London, £144,542 3s. 2d.; Grand Junction, £103,324 1s. 3d.; Kent, £117,844 12s. 1d.; Lambeth, £155,016 5s. 4d.; New River, £263,071 12s. 11d.; Southwark and Vauxhall, £65,841 7s. 9d.; and West Middlesex, £119,945 3s. 4d.—making a grand total of £1,059,597 16s. 3d. Compared with the previous financial year, the Chelsea, East London, and Lambeth Companies had increases of 4·6, 36·3, and 0·8 per cent. respectively; while the Grand Junction, Kent, New River, Southwark and Vauxhall, and West Middlesex Companies had decreases of 1·5, 1·2, 5·7, 18·5, and 3·7 per cent.

Heywood Water Supply.—On the occasion of a visit of inspection by the members of the Heywood Town Council to the new reservoir on Ashworth Moor, some interesting particulars of the work in progress were furnished by the Water Engineer (Mr. James Diggle), who said that the total capacity of the reservoir, when completed, would be about 350 million gallons; or, in other words, it would hold as much water as the three reservoirs in the Naden Valley and the one at Clay Lane. The size of the reservoir had been considerably increased from that proposed by the original scheme under the Act of 1877—a change necessitated by the utilization of the water from the Cheesden gathering ground. The total gathering ground from which water would be obtained for the reservoir amounted to about 1380 acres. After meeting the statutory obligations in respect of compensation water, there would be quite enough left to give a daily supply of 1¼ million gallons, which would be sufficient to meet the requirements of an increased population of 51,000, upon the basis of 25 gallons per head per day. The total estimated cost of the scheme, including the purchase of the lands forming the gathering ground, the catch-water drains and aqueducts, and lines of pipes between Ashworth Moor and Clay Lane, and from the latter reservoir to the Hebers reservoir, is £165,000, of which £22,240 had been expended up to Aug. 31.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There is to be no change in the price of gas in Edinburgh and Leith, which is to remain for another year at 3s. 4d. per 1000 cubic feet. This was decided by the Commissioners on Monday, after a perusal of estimates prepared by the Treasurer (Mr. John S. Gibb), with the aid of Mr. Herring. These bring out an anticipated surplus of £1047; but it seems to me that the estimates are too cautious, and that the fortunes of the Commissioners will be much better than they foreshadow. For instance, it is calculated that the quantities of coal and oil used, and the amount of gas sold will be the same as last year; whereas there is good reason to believe that there will be an increase in the business. A safe working estimate will make the situation less anxious to the officials; and, besides, any change on the estimates would not have been so great as to entitle the Commissioners to reduce the price of gas. The Commissioners regretted their inability to lower the charge; but they could not help themselves. Prices, like water, rise much more rapidly than they recede. As yet the full effect of what reductions in price have been affected is not felt. But the Commissioners have no reason to be regretful. The price of gas is 2d. per 1000 cubic feet cheaper than it was in 1888, when the Commission came into existence; and it is 1s. 2d. cheaper than it was in 1892. There has been no complaint at the price being continued at 3s. 4d.; and so we must conclude that the community have acquiesced in the policy.

The Commissioners in July last received a report by Mr. Herring upon the question of whether it would be advisable to lower the illuminating power of the gas; and they have since been considering his remarks. The report is given in another column;* and it will be seen that Mr. Herring is averse, from commercial considerations, to interfering with the illuminating power of the gas, and that he favours a generous policy of dealing with consumers—in the matter of keeping their burners right and advising them generally. The Commissioners adopted Mr. Herring's views, and resolved to do nothing in the way of lowering the illuminating power.

There was issued the annual statement of gas manufacture, prepared by the Engineer, which shows at a glance the working of the undertaking since 1888. Dealing with the past year, it is stated that in the Edinburgh works the output of gas was 1,243,568,000 cubic feet, of which 1,120,751,000 cubic feet were sold; and there was a percentage of 9·18 unaccounted for. The average illuminating power of the gas was 24·76 candles. There were 119,150 tons of coal carbonized; the yield of gas per ton of coal was 10,436 cubic feet; and the quantity sold 9408 cubic feet. The average cost of coal was 16s. 9·25d. per ton; the total cost being £99,728. The return from residuals was £25,548, making the net cost of coal £74,180, or 12s. 5·40d. per ton. Per 1000 cubic feet of gas made, the cost of coal was 14·32d.; and per 1000 cubic feet sold, it was 15·82d. Manufacturing and purification wages and charges were 6·89d. per 1000 cubic feet made; repairs, maintenance, and renewal of works and plant, 1·38d.; and repairs, maintenance, and renewal of mains, service-pipes, and meters, 1·95d. The total charges for manufacture and distribution were equivalent to 24·54d. per 1000 cubic feet of gas made, and 27·16d. per 1000 cubic feet sold. The quantity of gas made in 1889, the first full year of the Commission, was 847,723,000 cubic feet. The total cost of manufacture and distribution in that year was 20·78d. per 1000 cubic feet of gas made. It rose to 26·30d. in the succeeding year, was as high as 29·55d. in 1892, and two years ago was 19·53d. The rise to 24·54d. last year was entirely due to the increase in the price of coal, which rose from 9·46d. to 14·32d. per 1000 cubic feet of gas made. In the Leith works the make of gas was 641,143,000 cubic feet, of which 600,168,000 cubic feet were sold; the percentage unaccounted for being 5·59. The average illuminating power was 23·86 candles. There were 62,490 tons of coal carbonized; the yield of gas per ton of coal was 10,259 cubic feet; and the sale 9604 cubic feet. The average cost of coal was 17s. 1·92d. per ton; and the total cost was £53,618. The return from residuals was £15,257, making the net cost of coal £38,361, or 12s. 3·33d. per ton. The net cost per 1000 cubic feet of gas made was 14·36d., and per 1000 cubic feet sold 15·34d. The total charge for manufacture and purification was equal to 8·77d. per 1000 cubic feet of gas made. Repairs, maintenance, and renewal of works and plant cost 1·46d. per 1000 cubic feet made; and repairs, maintenance, and renewal of mains, service-pipes, and meters, 2·80d. The total charge for manufacture and distribution amounted to 27·39d. per 1000 cubic feet made. In the first year of the Commission, the make of gas was 425,622,000 cubic feet. In that year, the net cost of coal was 8s. 9d. per ton, and the total charge for manufacture and distribution of gas was 22·12d. per 1000 cubic feet made. It rose to 32·33d. in 1891; but two years ago it had fallen to 21·34d. It should be stated that the Leith works are very much worn out and over-taxed, and that in the Edinburgh works carburetted water gas is manufactured, both of which circumstances doubtless affect the cost of manufacture.

The Corporation of Peebles have issued a very learned opinion along with their decision as to the valuation of the gas-works—a decision which, however it may fare if it be brought under review, exhibits reasoning powers of a high order. The figures upon which my "Note" of a fortnight ago was based are not the same as those given in the decision of the Commissioners. According to this document, the Assessor raised the valuation of the undertaking to £700, maintaining, at the same time, that he would have been entitled to have entered the sum of £1336 in the valuation roll; and the Commissioners contended for a cumulo valuation of £286. The valuation has been fixed at £686. This figure was arrived at by taking the sum of £4902 as the revenue for the year, and deducting from it the following sums: Cost of coal and oil £2621, lime £83, salaries, wages, and gratuities £499, repairs and renewals of works, plant, and pipes £321, taxes and insurance £38, compensation to burgh for opening streets £20, salaries of Clerk and Treasurer £111, stationery and printing £24, general establishment charges £57, Auditor's fee £12, bad debts £7, depreciation £185, and interest at 5 per cent. on £4762

* See p. 92c.

of floating capital, £238—making together £4216, and leaving a balance of £686. The Commissioners quote largely from the opinions of judges in valuation cases. In regard to depreciation, they say that it applies entirely to moveable property belonging to the Commissioners, required for the carrying on of the business, and subject to a continual depreciation of considerable amount. Such depreciation, they say, would certainly be chargeable against any ordinary tenant's revenue, and would not, to any extent, fall upon the landlord. But under the rule which they had felt bound to adopt, any distinction between landlord's and tenant's charges no longer obtains with statutory commissioners unable to earn profit. By that rule, the Court had been guided; but as regarded particular items, they had been confirmed by the cases cited where similar items, in questions with companies earning profit, had been allowed as deductions chargeable against tenant's profits. No mention is made of annuities or of sinking funds for repayment of borrowed money. The effect of the decision, therefore, is that those items are to be treated as heritage, and assessment paid upon them. It is there where the weakness of the decision crops out. As will be seen from the list of items given, almost every conceivable charge in the carrying on of the undertaking is deducted from the revenue, and in order to find out what would remain to a tenant, except these two sums; and they are sums which it is as imperative a tenant would have to pay as is the price of coal. Certainly, they are far more necessary than an allowance for depreciation. Annuities seem to be regarded as profits which go into the pocket of the hypothetical tenant. But are they? I think not. The annuities are the rent payable by the tenant to the landlord, and the sinking fund is paid by the tenant to those who assist him into the holding. I think they ought to be deducted from the revenue, before the amount of profit is arrived at. Some more substantial basis should be found upon which to fix the valuations of public works than the amount of the annuities and sinking fund, because, as I pointed out two weeks ago, if the time should ever arrive when the annuities are all redeemed and the borrowed money all repaid, the Commissioners would carry out the undertaking without raising those sums, and it would altogether disappear from the valuation roll.

Mr. G. Keillor, jun., the Manager of the Peterhead Gas-Works, has begun a series of experiments in street lighting by means of high-pressure incandescent lamps. They have been highly successful so far, and have given the utmost satisfaction in the town.

The shareholders of the Carnoustie Gas Company held a special meeting last Saturday, to confirm a resolution adopted on Sept. 4, giving the Directors power to borrow £6000 for the extension of the works. As on the former occasion, Mr. J. Hunter, jun., solicitor, of Dundee, objected to the passing of the resolution. He challenged the financial policy of the Board, and threatened that the matter would go further. Mr. Hunter is only running his head against a wall. Even though it should be the case that the Company's business could have been better conducted than it has been (which is by no means established), any action he might take will be futile. The resolution was confirmed with almost unanimity; the action of one or two shareholders, in opposition to the general body, is never countenanced. If objection be taken on points of form, these can easily be remedied; and the only gain which Mr. Hunter could get would be any satisfaction he might derive from causing delay and inconvenience to the Directors and the Manager.

An article was published in the "Dundee Advertiser" on Tuesday last, dealing with Scottish gas-works generally, and the gas undertaking at Newport (Fife), which has been recently acquired by the Corporation, particularly. The author has culled freely from the statistical report as to gas supply which is issued by the Committee of the North British Association of Gas Managers; and he appears to be highly pleased at being able to bring out the circumstances that works managed by corporations supply at a cheaper rate than those owned by companies. He mentions seven towns, in which the average price is 4s. 3½d. per 1000 cubic feet. In Newport, the price charged by the Company was 5s. 2d. Well, his method of proving what he wished to prove is open to objection. I do not follow him into that; but it is interesting to learn that the Corporation are about to expend £17,000 upon the erection of new works, and that they are to introduce the most modern plant, by which they will be able to make first-rate gas and sell it at 4s. 6d. or 4s. 9d. per 1000 cubic feet. It is, he says, the Council's aim to improve the quality of the gas and then reduce the price to a level which will lead to a large increase in consumption. And, further, the price of gas will be subject to periodic reduction as the debt gradually becomes extinguished. I daresay the Corporation will find their course a somewhat uphill one. If they tackle it in the spirit breathed in this article, they will get along more cheerfully—but this gas commissioner may find that his rosy dreams have not been quite realized.

The Gas and Electric Lighting Committee of the Aberdeen Town Council this week accepted tenders for 24,000 tons of coal, which makes up the quantity that will be required during the year. The average price for the whole year is 19s. 1d. per ton. Powers are to be sought to borrow during the next ten years £200,000 for the gas and electric lighting undertaking.

The scarcity of water in Edinburgh is beginning to assume a serious aspect. The Water Trust have reduced the supply from 40 or 41 gallons per head per day to 18 or 20 gallons, and have issued urgent notices to the citizens to be as careful as possible. On account of the decreased pressure, it is found that cisterns in high tenements do not fill. Many people have therefore to carry water from the houses of their more fortunate neighbours. A fire-engine is kept at work filling the cisterns in the upper flats of public institutions. There was a little rain during the week; but not sufficient to turn the shrinkage of the water in the reservoirs into an expansion. The outlook for next summer is not very cheering. Unless the winter be a more than usually wet one, the gathering grounds are so depleted of water now that they will be easily exhausted. Should the winter and the summer be both more than ordinarily dry, the position of the citizens would be lamentable.

The Corporation of Arbroath have come to terms with Messrs John Paterson and Son, Limited, of Glasgow, the Contractors for the extension of the underground works connected with the town's water supply.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 897.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME	Closing Prices.	Rise or Fall in Wk	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	19½—20½	..	4 17 7
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb.	100—102	..	4 18 0
200,000	5	May 15	6½	Bombay, Ltd.	6¼—6⅝	..	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4¼—4½	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	..	4 8 11
270,000	,,	,,	9	Do. New	192—197	..	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	130—135	..	3 14 1
206,250	,,	June 14	4	Do. 4 p.c. Deb.	113—116	..	3 9 0
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	222—227	+2	4 8 1
246,320	,,	,,	7	Do. A. Ord. Stk.	155—160	+2	4 7 6
1,047,500	Stk.	Aug. 28	5	Bristol, 5 p.c. max.	118⅞—119½	+2	4 3 8
420,000	20	Sept. 27	10	British	41—42*	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c.	19—21	..	4 5 8
500,000	10	May 31	6	Buenos Ayres (New) Ltd.	9—9½	..	6 6 4
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	July 17	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14½—15½*	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	277—282	..	4 5 1
236,425	,,	,,	9	Do. New do.	207—212	..	4 4 11
238,237	,,	June 14	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	May 31	9	Continental Union, Ltd.	163—168	..	5 7 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	162—167	..	4 3 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd.	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 1/16	Gas-light and Coke — 4 p.c. Ord.	98—100	..	4 8 0
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	111—114	..	3 10 2
4,063,425	,,	June 14	3	Gas-light and Coke — 3 p.c. Con. Deb.	91—93	..	3 4 6
70,000	10	May 31	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	May 15	10	Imperial Continental	213—216	+1	4 12 7
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	100—102	+1	3 8 8
561,000	Stk.	Aug. 29	10	Liverpool United A	231—233	..	4 5 10
718,100	,,	,,	7	Do. do. B	170—172	..	4 1 5
306,083	,,	June 28	4	Do. do. Deb. Stk.	119—120	..	3 6 8
75,000	5	June 14	4	Malta & Medn., Ltd.	4½—5	..	4 0 0
560,000	100	Oct. 1	5	Met. of — 5 p.c. Deb.	104—107*	..	4 13 6
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	102—104*	..	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd.	9—10	..	7 0 0
717,946	Stk.	Aug. 9	8½	Newc'tle & G'tesh'd Con.	224—226	..	3 15 3
312,855	Stk.	June 28	3½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
150,000	5	May 15	8	Oriental, Ltd.	7⅞—8⅛	..	4 17 5
135,000	5	,,	8	Do. New, £4 10s. pd.	7—7½	..	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1⅜—1⅝	..	4 11 5

*Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
60,000	5	Sept. 27	7	Ottoman, Ltd.	5¾—6¼*	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord.	10¾—11¼	..	6 4 5
250,000	Stk.	June 28	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd.	11—12*	..	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	240—243*	..	4 2 4
209,984	,,	,,	10	Do. B	240—243*	..	4 2 4
523,498	,,	,,	10	Do. C	240—243*	..	4 2 4
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	125—128	..	3 18 2
1,627,965	,,	July 17	3	Do. 3 p.c. Deb.	91—94	..	3 3 10
380,940	Stk.	May 15	5	Southampton Ord.	107—112	..	4 9 3
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton — A. 5 p.c.	120—125	+5	4 8 0
250,520	,,	,,	4	Tottenham and Edmonton — B. 3½ p.c.	90—95	+5	4 4 3
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c.	9⅝—10½	..	4 5 9
172,000	10	,,	6	Do. 7 p.c.	12½—13½	+½	4 8 11
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.	107—112	+4	3 11 5
				WATER COMPANIES.			
780,599	Stk.	June 28	11	Chelsea, Ord.	308—313	+8	3 10 3
150,000	,,	,,	5	Do. 5 p.c. Pref.	152—157	..	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb.	138—143*	..	3 2 11
1,720,560	Stk.	Apl. 12	7	East London, Ord.	203—208	+3	3 7 4
654,740	,,	June 14	4½	Do. 4½ p.c. Deb.	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb.	95—97	..	3 1 10
700,000	50	June 14	8	Grand Junction — 10 p.c. max.	112—115	+2	3 9 7
310,000	Stk.	Sept. 27	4	Grand Junction — 4 p.c. Deb.	122—126*	..	3 3 6
708,000	Stk.	Aug. 15	14	Kent	290—295	+2½	4 14 11
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max.	297—302	+12	3 9 6
406,200	100	,,	8	Do. 7½ p.c. max.	215—220	+3	3 12 9
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb.	125—130*	+2	3 1 7
500,000	100	Aug. 15	12 5/10	New River, New Shares	395—405	+5½	3 3 2
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
902,300	Stk.	June 14	6	Southwark and — Ord.	193—198	+11	3 0 7
126,500	100	,,	6	Southwark and — 7½ p.c. max.	178—183	+11	3 5 7
489,200	Stk.	,,	5	Southwark and — 5 p.c. Pref.	147—152	..	3 5 9
1,019,585	,,	Apl. 12	4	Vauxhall — 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 14	10	West Middlesex	290—300	+15½	3 6 8
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	138—143	..	3 2 11
200,000	,,	Sept. 12	3	Do. 3 p.c. Deb.	94—97*	..	3 1 10

*Ex. div.

The original contract was for £4897; but, as is usually the case, the work enlarged as it went on, and the account of the Contractors came to £12,518. They had been paid £5000; and their claim was for the balance of £7518. They have, however, agreed to accept £1500. Having set the new water-works going, the Corporation are about to consider the question of where they can get a further supply. The scheme which has just been completed is not sufficient; the total yield being only about 14 gallons per head per day.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 5.

Sulphate of Ammonia.—There has again been a well-sustained demand, and there has been some improvement in Scotland; the closing quotations being £10 12s. 6d. per ton f.o.b. Hull, £10 16s. 3d. per ton f.o.b. Leith, and £10 18s. 9d. per ton f.o.b. Liverpool. Middlemen have been less in evidence; but there has been larger direct demand, and available supplies have been readily absorbed. Germany has been very quiet, but France is becoming interested, owing no doubt to the cheapness of sulphate of ammonia in relation to nitrate of soda. There has been no new feature in the forward position; buyers still holding out against the premium demanded by makers.

Nitrate of Soda is quiet, but steady, in all positions; the spot prices remaining at 9s. 3d. and 9s. 4½d. per cwt. for good and refined qualities, respectively.

LONDON, *Oct.* 5.

Tar Products.—The demand for pitch continues very strong from South Wales, especially for early delivery. Business in patent fuel appears to be very good, but only for prompt delivery, as the makers decline to pay existing prices for pitch over next year. In London there is no business to report. There are buyers at 31s. 6d. October-December; but makers ask 32s., and are reported to have declined 31s. 6d. for January-March. In the North, prices are, if anything, a little easier. Larger quantities are offering, doubtless owing to several important tar contracts having recently been fixed. Sales of 90 per cent. benzol have again taken place at 9½d. per gallon, October delivery; and there is a report that a small business was actually done at 10d. for October-March. In 50-90 per cent. business is limited; but several small parcels have been placed at 9½d. for delivery this year. In anthracene there is nothing fresh to advise. It is not likely that there will be any improvement for some time to come. In crude carbolic acid, the demand appears to have been very strong for the end of September, as 2s. 1d. and 2s. 2d. have been paid for 60's, September shipment. There is a general impression that there will be a strong inquiry for October, as several makers are reported to be over-sold. An offer of 1s. 11d., October-December, was declined by one of the largest makers, who asks 2s. over this period. In solvent, a little business has been done, for best London makes, at 1s., home consumption October-December, but as far as export is concerned, there is nothing doing. Creosote continues very dull, especially in the North. Consumers will not offer more than ¾d.; but as the oil is worth more than this as liquid fuel, it is not likely that business will result. Should the present depression continue, most large manufacturers will burn considerable quantities during the winter. As regards tar, prices are decidedly easier; and recent contracts have been let on terms more favourable for the distillers. The great depression in creosote deters contractors from paying high prices; and it seems probable that lower values will be accepted for tar, as the prices recently paid must leave distillers with a loss at the present prices of products.

The average values obtaining during the week are: Tar, 14s. 6d. to 17s. 6d. Pitch, east coast, 31s. to 31s. 6d.; west coast, 28s. 9d. to 29s. 3d. Benzol, 90's, 9½d.; 50's, 9¼d. Toluol, 10d. Crude naphtha, 4⅛d. Solvent naphtha, 10d. to 11d. Heavy naphtha, 10d. Creosote, ⅝d. to 1¼d. Heavy oils, 2d. Carbolic acid, 60's, 1s. 11d. Naphthalene, 60s. to 70s.; salts, 37s. 6d. to 45s. Anthracene, "A," 2¼d. to 2½d.; "B," unsaleable.

Sulphate of Ammonia.—The market continues steady; and there is nothing special to advise. The Gaslight and Coke Company are still sellers at £10 15s. October-December, and now decline to quote for next year, believing in better prices. In Hull, business has been done at £10 12s. 6d. October shipment; but makers ask £10 15s. November-December. In Leith, further sales are reported at £10 15s.; and an offer of £11 January-March was declined by manufacturers. In Liverpool, prices continue steady; but there is not at present very much doing at this port.

COAL TRADE REPORTS.

Lancashire Coal Trade.—Generally throughout the round coal trade of this district, business is moving steadily on the basis of rates ruling last month, which are very firm, with perhaps some slight tendency to harden in the common qualities of round coal, where they have previously been cut very low to secure orders. There is still no real pressure for house-fire sorts; but the demand is taking away what the collieries are raising, and the pits are mostly now running practically full time, which represents five days per week. Inland requirements for steam and forge purposes, and also the shipping demand for common round coals, continue on the increase; but there are still fairly ample supplies offering. Engine fuel remains weak, owing to the excessive quantity, especially of the lower sorts, that are being pushed for sale from outside districts; and some of the Lancashire collieries quote below the current rates on forward contracts, which may be taken as some indication that there is no very confident tone with regard to the future. At the pit, best Wigan Arley coals average 15s. per ton, Pemberton four feet and seconds Arley 13s. to 13s. 6d., common house coal 11s. to 11s. 6d., steam and forge coal 9s., with steam coal, delivered at the Mersey ports, 10s. to 10s. 6d., and house-fire qualities from 13s. upwards. Lancashire engine fuel ranges from 5s. 6d. to 7s. 6d. per ton, according to quality, with Derbyshire slack, which is the chief

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

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ORDERS RECEIVED IN 1901 TO MARCH 1 . . . . 3,500,000 CUB. FT. DAILY.

MALTON . . 150,000 Cubic feet. **SMETHWICK . . 500,000 Cubic feet.**

competitor, to be bought from as low as 2s. 6d. upwards, at the pit. Coke continues in brisk demand; and to meet requirements the local make has recently been considerably increased. This is, however, meeting with a ready sale, and prices are very firm on the basis of 24s. to 25s. per ton for Lancashire foundry cokes, 14s. to 15s. for good Lancashire furnace cokes, 13s. to 14s. for washed Yorkshire furnace sorts, and 11s. 6d. to 12s. for unwashed cokes.

Northern Coal Trade.—There is still a very active demand for gas coals; but steam sorts are in lessened request, and lower in price. Best Northumbrian coals are now from 12s. to 12s. 3d. per ton. f.o.b.; the demand for the Baltic having very greatly fallen off. Steam smalls are from 5s. to 5s. 3d., and the demand is steady for the present; but for future delivery it is not so brisk, and prices may be a little easier. In the gas coal trade, there is a steady and growing inquiry, which must be further enlarged as the nights lengthen. For best Durham gas coals, the price for occasional cargoes is from 12s. to 12s. 6d. per ton f.o.b., and for second qualities about 11s. 6d. The coke trade is steady. Best Durham coke is 17s. 6d. to 18s. per ton f.o.b.; but the exports are rather less than they were. The price of gas coke for export is quoted on Newcastle Exchange as from 12s. 6d. to 13s. per ton f.o.b.

Scotch Coal Trade.—There is a slightly better demand, especially for splint. Other sorts are still a slow sale. The prices quoted per ton f.o.b. Glasgow are: Main 9s. to 9s. 3d., ell 10s. 6d. to 11s. 6d., and splint 10s. 9d. to 11s. The shipments for the week amounted to 208,417 tons—an increase of 72,093 tons upon the preceding week, but a decrease of 39,565 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,290,778 tons—a decrease of 929,058 tons upon the same period of last year.

Destruction of a River Dam at Dover.—It is not a little remarkable that the recent destruction of the dams on the Walverden stream at Nelson, to which reference is made in the article on the "Drought in the North of England" which appears elsewhere, should have been followed, within a few days, by a similar proceeding, though not resulting from a like cause, at Dover. The Corporation of that town have lately acquired for £3000 the water rights over the River Dour; and it was deemed necessary by the officials of that body that a dam constructed at a place known as the Tanyard should be removed. Accordingly, in compliance with orders, a gang of men early last Wednesday morning betook themselves to the spot to demolish the dam. The builder of the dam, however, had had sentinels posted, and the police were called in to take the names of the Corporation employees engaged in destroying his work. An amusing fact was that, anticipating trouble, the Corporation officials had a number of constables handy, and these men were employed against their fellow-officers. Shortly after the demolition of the dam, the employees of the Tanyard Company set to work and built another, which it was understood would be similarly destroyed; and so the merry game would go on. The workmen of the Corporation are threatened with prosecution for trespass. Local feeling is very strong on the matter; but the action of the Corporation is entirely approved.

Bexhill Water and Gas Company.—The ordinary general meeting was held on Monday last week, at the Cannon Street Hotel—Mr. Robert Kersey presiding. In moving the adoption of the report, the Chairman referred to the financial result of the half-year's working as compared with that for the corresponding period of the previous year, and said he thought that, considering all circumstances, the statement of accounts submitted would be regarded as satisfactory by the shareholders. The Board were enabled to recommend a dividend for the six months ended June 30 last at the rate of 7 per cent. per annum on the "A" shares, and at the rate of £4 18s. per cent. per annum on the "B" shares, tax free. The Manager reported that all the works had been kept in an efficient state, and additional gas and water services had been laid on. The whole of the works at Wrest Wood were complete. A good supply of water had been obtained from this source, and the other two wells maintained their yield. The gas-works were also finished. Their substantial outlays were now at an end; and the Directors anticipated a considerable increase in the net profit this half year. Mr. Pilley seconded the motion, and it was carried.

Sales of Shares.—A parcel of Wakefield Gaslight Company's shares has been disposed of by auction. Seven shares of £25 each found a buyer at £66 11s.; and 124 £5 B5th shares produced prices varying between £10 12s. 6d. and £11. At a recent sale at Runcorn, 20 £5 shares in the Runcorn Gas Company realized £10 14s. each, 60 shares £10 13s. each, and 25 shares £10 11s. each. £800 4 per cent. debenture stock produced £815. On the same occasion, 56 fully-paid £10 "B" shares in the Frodsham Gas Company (the last dividend paid on which was 7 per cent.) yielded from £16 5s. to £16 10s. per share, and 16 £10 "A" shares in the same Company (the last dividend on which was 10 per cent.) produced £22 15s. each. Ten £5 shares in the Camborne Gas Company have recently changed hands at £4 17s. 6d. apiece. On behalf of the Stretford Gas Company, Messrs. W. Wilson and Son offered for sale last Tuesday 2500 of the new issue of "B" £10 (5 per cent.) shares. They were put up in lots of ten, and found purchasers at prices ranging from £11 to £11 5s. per share. The additional capital is required for the enlargement of the Company's manufacturing plant, the extension of the mains, and for general working purposes. The eighth sale of 1500 £5 shares in the Portsmouth Water Company took place last Thursday evening, by Mr. Ernest Hall, of the firm of Messrs. Hall, Pain, and Goldsmith. There was good competition for the 300 lots; but the premium was slightly lower than that obtained at previous sales. Of the 300 lots, 59 were sold at £6 10s. per share, 166 at £6 7s. 6d., and 75 at £6 5s. The total amount realized by the sale was £9552 10s., against £9672 11s. for 1500 shares sold in June, and £10,170 12s. 6d. for those sold in April of the present year. A sum of £60,000 has now been added to the Company's capital under their Order of 1898. The Auctioneer, in commenting upon the recent resolution of the Corporation to abandon the effort for purchasing the works, said that the shareholders were perfectly content with the business capacity of the Directors, in whose hands they felt quite safe. The shares were "gilt-edged" securities, and were practically as good as Bank notes. The new shares bear interest at the rate of 5 per cent. per annum.

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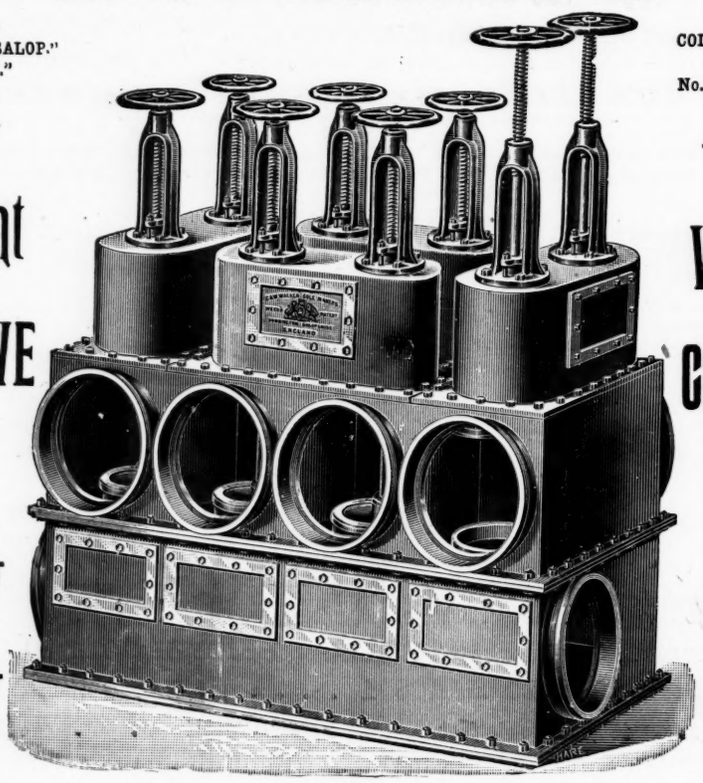

Weck's Patent CENTRE-VALVE

PERFECTLY TIGHT UNDER EVERY EXTREME OF HEAT OR COLD

THE ONLY ABSOLUTELY RELIABLE CENTRE-VALVE IN THE MARKET.

Cardiff Water-Works Assessment.—At a recent meeting of the Merthyr Union Assessment Committee, Mr. Halloran, on behalf of the Cardiff Corporation, supported an appeal for the reduction of the assessment of the Cardiff Water-Works in the parishes of Merthyr and Vaynor. Mr. Halloran stated that the cost of construction of waterworks properties in Merthyr parish had been £43,270, and in Vaynor £23,706. He argued that an assessment of 3 per cent. upon the total cost was the proper method, according to cases decided by *Liverpool Corporation v. Llanfyllin* and *New River Company v. Hertford;* and that upon such basis of calculation there should be a reduction in the assessment of their Vaynor properties from £864 to £711, and of the Merthyr properties from £2002 to £1298. Mr. C. H. Priestley, the Cardiff Water-Works Engineer, made supporting statements; and eventually the Committee decided to refer the question to their expert valuer, and promised to give Mr. Halloran due notice when the appeal would be considered.

Fatal Accident at the Bristol Gas-Works.—On the 27th ult. an inquiry was held by the Bristol Coroner (Mr. H. G. Doggett) into the death of James Hooper, aged 60, a labourer in the employ of the Bristol Gas Company. Henry Barnett, a mason, said that on Aug. 30 he was working with deceased at Canon's Marsh, cleaning out the flues of the retorts. To do this they had a plank 11 inches wide stretched across the girder of the building over the retorts. The deceased's business was to move the plank from one flue to another. Witness had taken off the cover of a flue, and the deceased was standing behind him on the end of the plank. While witness was engaged in scraping out the flue, he suddenly heard screams, and on turning round saw the deceased lying on the dust at the top of the retorts. This dust was of great heat. Witness at once pulled the deceased out of the dust, and got him to the ground. He was afterwards taken to the Infirmary. The depth of the dust would be from 4 to 5 inches. Witness himself was burnt in getting the deceased out. From the plank to the top of the retort was about 15 inches. Deceased, who was working in his shirt sleeves, was badly burnt about the arms. When he fell, witness did not feel any movement of the plank. The deceased was a good workman, and was not at all careless. Mr. J. Fisher, Superintendent of the Gas Company, said that he was near at hand when the accident occurred. Deceased was accustomed to the work. There was a slope to the girders on which the plank rested; but it was very slight, and there was no necessity for fixing the plank. Just before the accident, the previous witness had told deceased to be careful, as there was not too much room to work in. Probably the deceased was walking along the plank, and, turning giddy, fell into the dust. The House Surgeon at the Royal Infirmary said deceased was terribly burnt about the arms, and was suffering from shock. His arms went on well for a time; but eventually they became so painful, and the deceased was suffering so much from exhaustion, that it was thought advisable to amputate one arm. After the operation congestion of the lungs set in, which ended fatally. The Jury returned a verdict of "Accidental death."

Slot Meters at St. Helens.—At the meeting of the St. Helens Town Council last Wednesday, the Chairman of the Gas Committee (Alderman Cook) stated that, notwithstanding the electric light, the consumption of gas was still increasing. Nearly £1000 more had been received from slot meters in the past half year than in the corresponding six months of 1900.

Tadcaster Water Supply.—The townships of Tadcaster East and West having applied, through the Rural District Council, to the Local Government Board for sanction to borrow the sum of £10,849 for works of water supply, an inquiry into the matter was held last Tuesday at Tadcaster by Mr. R. H. Bicknell, M.Inst.C.E. The population of these places has increased during the past decade from 2812 to 3043; and the average death-rate is 18 per 1000. In 1897, the Local Government Board refused to sanction a scheme of water supply from the river. In October, 1898, they received samples of water from a boring at Bilbrough—about four miles from Tadcaster—which were found to be satisfactory, though the water was rather hard. According to the Engineer's report, the well would contain a total of 220,000 gallons, equal to a three days' supply for a population of 3500, with 50,000 gallons to fall back upon. The township of Bilbrough would be supplied at the same rate as Tadcaster, without any extra charge for the works. The Inspector pointed out, after examining the plans, that the Board would probably require two pumps, one being insufficient; and he asked that further details as to the scheme might be supplied to him. At the close of the inquiry, he proceeded to view the borehole at Bilbrough.

New Water-Works for Shipston-on-Stour.—The inhabitants of Shipston-on-Stour are now in possession of an ample service of good drinking water. For some time past, the Rural District Council have been endeavouring to supply this much-needed want; the Local Government Board having forced their hands in the matter. After various schemes had been investigated and found inadequate, Messrs. Willcox and Raikes, of Birmingham, were called in; and eventually their scheme for supplying the town from a spring at Ebrington, about seven miles distant, was adopted and carried out. By this Shipston is entitled to the first 40,000 gallons of water per day obtainable from the spring. The total cost of the scheme has been about £7000; the contract of Mr. T. Vale, of Stourport, being £2980, and the cost of the pipes £2679. Towards this total, Mr. Richard Badger, a former resident at Shipston, who has on several occasions helped forward deserving objects in the town, gave £1000, without which it is doubtful whether the scheme would have been carried out. At the opening ceremony last Thursday, there was a large gathering, which included several officials of neighbouring authorities. The spring was first visited, and then the party drove to the reservoir, where Mr. Walford, the Chairman of the Council, turned on the water. Arrived at Shipston, Mr. Willcox explained the scheme, and presented Mr. Badger with a silver key, with which that gentleman turned on the water amid cheers. Luncheon was subsequently served at the White Horse Hotel, at the invitation of Messrs. Willcox and Vale—Mr. Walford presiding.

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Giving a Lighting Efficiency of 300 CANDLES PER BURNER with about 10 Cubic Feet of Gas

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Specially Suitable for Lighting Large Areas.

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The Welsbach Shadowless Lantern, with Self-Intensifying Welsbach-Kern Burner.

FOR FURTHER PARTICULARS APPLY TO THE

WELSBACH INCANDESCENT GAS-LIGHT CO., Limited,

PUBLIC LIGHTING DEPARTMENT, YORK STREET, WESTMINSTER, LONDON, S.W.

Water Scheme for Bedford.—At the meeting of the Bedford Town Council on Wednesday, it was decided to affix the common seal to a contract entered into with Mr. G. F. Deacon, M.Inst.C.E., employing him to act as their Engineer in connection with a scheme for obtaining a new water supply from a site near Henlow Station (North Beds.), which had been approved by him. The Town Clerk was instructed to take the necessary steps to promote a Bill in Parliament.

Birmingham's Welsh Water Scheme.—The Water Committee of the Birmingham Corporation last Friday decided to recommend the Council, at their next meeting, which has been fixed for the 22nd inst., to apply to Parliament for an extension of the period specified for the completion of the Welsh water scheme. Under the Act of 1892, the date fixed was June 27, 1902; but it was found that more time is necessary. The Committee, however, hope that the Welsh supply will be available some time in 1903. In the Bill which will be promoted, permission will be asked to abandon certain works already sanctioned which are now found to be unnecessary, and substitute others which experience has shown will be needed in certain cases. These alterations will, it is stated, effect a saving on the scheme.

Nottingham Gas and Water Finances.—The reports of the Elective Auditors (Mr. Walter Gath and Mr. Mark Mellers) on the accounts of the city of Nottingham for the year ending the 31st of March last, have been presented to the various Committees of the Council. They show that the total capital invested in the gas undertaking up to the close of the past financial year was £1,084,333, and that the gross profit realized was £76,811. After deducting the charges for interest on capital, sinking fund proportions, and depreciations on stores, amounting to £49,688, the net profit was £27,123. In the Water Department, the net profit was £4766, the whole of which was appropriated by the Water Committee for capital purposes—a proceeding which does not have the approval of Mr. Gath, who thinks the money should have been devoted to the relief of the rates.

The Lighting of Private Streets.—"The question is often raised," says the "Local Government Journal," "whether a local authority can legally undertake the lighting of streets which have not been adopted as public highways; and it is possibly due to the doubt which exists on this subject, and to a reluctance to do anything which may prejudice their right to enforce the ultimate paving and making-up, at the cost of the frontagers, that local bodies are sometimes so slow to put lamps in new thoroughfares. The fact is, however—and it should be widely known among suburban ratepayers, to whom the lighting question is again becoming important—that local authorities may do all that is required for illuminating purposes in a street, without any fear of a disallowance by the Auditor, and that the presence of public lamps in a road is no evidence whatever that it is repairable by the inhabitants at large."

The Directors of the Buenos Ayres (New) Gas Company, Limited, announce that they have declared an interim dividend at the rate of 5 per cent. per annum for the six months ending the 30th of June last.

The Knaresborough Urban District Council are considering the question of promoting a Bill in the next session of Parliament to (among other things) extend the area of the gas and water supply, and to introduce electric light and power.

The Huddersfield Corporation propose to apply to Parliament next session for an amendment of the Water Act of 1869, so as to enable them to charge for water supplied to licensed premises by meter or by rent based on the value of the property as assessed to the poor or otherwise.

Damage to the amount of £25,000 was done by a fire at Laurel Bank Mill, Nelson, occupied by Mr. John Wilkinson, cotton manufacturer, last Thursday. The outbreak occurred while an escape of gas was being located. The Fire Brigade were powerless, and the large warehouse was completely gutted.

Last Tuesday afternoon, an exhibition of Wilson's gas cooking and heating stoves was opened in the Corn Exchange, Chester, under the auspices of the Chester Gas Company. Miss Edith Sanderson gave cookery lectures and demonstrations. The Gas Company had on view a fine display of incandescent gas-fittings.

Messrs. Clapham Bros., Limited, of Keighley, have received an order from the Manchester Corporation for the erection, for their Rochdale Road station, of a purifying-house comprising stage-floor, steel roof, and four cast-iron purifiers, each 45 ft. 9 in. by 39 ft. 6 in., and 5 ft. 3 in. deep. They are to be fitted with 24 "New Century" covers, with Clapham's patent "Eclipse" joints and holding-down apparatus complete.

The Hollingbourne Rural District Council have adopted a report of a Committee who were appointed to consider the question of the water supply of the district comprising Hollingbourne, Harrietsham, Leeds, and Lenham. The Authority were advised by Messrs. Stevenson and Burstall; and for the scheme which they recommend, it is proposed to apply to the Local Government Board for sanction to borrow £6500. Before, however, this step is taken, the views of the parishes concerned are to be ascertained at public meetings.

In connection with the Leeds Corporation new water-works scheme, an arbitration has been commenced for the purpose of assessing the amount of purchase-money to be paid by the Leeds Corporation to Mr. Henry Bramley, of Harrogate, in respect of the compulsory acquisition from him of his lands at Fewston, comprising an area of about 56 acres. Sir John F. S. Rolleston, of Leicester, is the Umpire; and the Arbitrators are Mr. George Renton, of Harrogate, for the claimant, and Mr. J. W. Dacre, of Otley, for the Corporation.

The Board of Education have issued a circular to managers and teachers of urban elementary schools in reference to the eyesight of scholars in schools in large towns. In the course thereof, they point out that the lighting of the schools and the right position and sufficient supply of artificial light are matters of great importance. They state that electric light has the double advantage of consuming no oxygen and of being moveable and therefore convenient; but if gas must be employed, incandescent illumination is preferable to the ordinary fish-tail burner,

Gas-Fires.

The "QUEEN."

By a special improved arrangement for utilizing the waste heat (as shown in drawing of section), no heat whatever is lost. The whole of the products of combustion pass away by the flue, while air, admitted at the sides, is warmed and passes into the room through the perforated top panels without coming into contact with the burnt gases. This, combined with the cheerful, radiant fire, makes a very near approach to an ordinary coal fire.

Section, showing arrangement for utilizing waste heat.

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NOTICE IS HEREBY GIVEN.

IT is recorded in the "Book of Experi- ence" at Smethwick that it does not require a Gas Engineer to be a man of patient habits of observation, or superabundantly endowed with the power of comparison, to grasp the distinctions between a Conveyor that "Carries" the Coke and Conveyors that "drag," "scrape," or "push" coke; and it is likewise recorded in the said book, which is open for inspection at Smethwick, that the Gas Engineer who does not yet see the advantages of the Hot-Coke Conveyor that "Carries" the Coke, over Conveyors that "trail," "drag," or "scrape" coke, must be a man gifted with negligent habits of observation, and not entitled to an advance in his salary from his Committee or Directors.

Applications for Drawings, Specifications, and Tenders for the Hot-Coke Conveyor that "Carries" the coke should be addressed to me the minute the Gas Engineer recommends his Committee or Directors to make a further reduction in the carbonizing wages.

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WANTED, a Situation as Rental and ACCOUNTS CLERK. Applicant (age 20) has had general experience in a Gas Office, and is well acquainted with general routine and the Cash Desk. Good References.

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Apply, stating Wages required, with *Copies* of Three Testimonials, to the ENGINEER, Gas-Works, Gravesend, KENT.

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Applications, accompanied by *copies* of three recent Testimonials, stating Age, Experience, and Salary required, to J. H. BROWN, Gas-Works, ILFORD.

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WANTED, a Man to set Retorts and do general Bricklaying at Works near Birmingham. Must be used to Regenerative Settings. Permanent Situation to suitable Man.

State Age, Experience, Wages required, &c., to No. 3753, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for the Gas-Stove Trade, an experienced TRAVELLER for London and Suburbs. Salary and Commission. Must have good connection among Gas Companies and the Trade.

Reply, by letter, stating Age, Qualifications, and previous Experience, to No. 3756, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SERVICE Layer Wanted. One who can fix and read Meters, and repair Mains preferred. Medium sized Works within 40 miles of Birmingham. Character of Applicants must bear strictest investigation.

State, by letter, Age, Wages required, and Particulars of previous engagements, enclosing *copies only* of Testimonials, to No. 3752, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON OF FINEST QUALITY.

BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.

Send for full Particulars to
BALE & Co., 120 & 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

THE Newcastle-upon-Tyne and Gates- head Gas Company require a SUPERINTENDENT for their Public Lamp Department. Applicants must have had previous experience.

Application to be made, on or before the 22nd of October, in Candidate's own Writing, stating Age, Salary required, and giving Particulars of Experience with *copies* of recent Testimonials, to

THOS. WADDOM,
Secretary.
Newcastle-upon-Tyne.

EXHAUSTER, good Second-hand, com- plete with Valves, to pass 30,000 to 50,000 Cubic Feet per hour, wanted at once.

Send Particulars, with Price, delivered on Gas-Works, to WILLIAM TITLEY, Secretary, Gas Offices, GUILDFORD.

GAS Apparatus complete, inclusive of Gasholder, 40 feet by 14 ft., with Cast-Iron Tank (5 in.– 6 in. Connections throughout), weighing about 82 Tons. Convenient to Railway Siding near Edinburgh. Price for immediate Cash and Removal £160.

Apply to the Owners, D. M. NELSON AND CO., Gas Engineers, GLASGOW.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—

GASHOLDER (with Wrought-Iron Tank), 30 ft. by 12 ft. Cable Guided. New in 1895.
CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.
Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.

Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

EAST DEREHAM URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS are invited for the supply of 1010 yards of 4-inch CAST-IRON PIPES and 450 yards of 3-inch CAST-IRON PIPES; also Two 4-inch SYPHONS and Two 3-inch SYPHONS.

Tenders, endorsed "Pipes," to be sent in to me by the 15th of October.

B. H. VORES,
Clerk to Urban District Council.
East Dereham.

BOROUGH OF LEIGH.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee of the above Corporation invite TENDERS for the supply of about 200 Tons of natural OXIDE OF IRON.

Forms of Tender and any further Particulars may be obtained from the Manager, Mr. John Foster, Gas and Water Works, Leigh.

Sealed Tenders, endorsed "Tender for Oxide of Iron," to be sent to me the undersigned not later than Twelve o'clock noon, on Saturday, the 19th day of October, 1901.

By order,
PEREGRINE THOMAS,
Town Clerk.
Town Hall, Leigh, Lancs.,
Sept. 30, 1901.

BOROUGH OF CHORLEY.

TO COLLIERY OWNERS AND OTHERS.

THE Chorley Corporation invite Tenders for the supply of 8000 Tons of GAS SLACK, required at their Gas-Works for a period of Eight Months, from the 1st of November, 1901, to the 30th of June, 1902.

Forms of Tender and any further Information may be obtained on application to Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, endorsed "Gas Slack," to be sent to me, on or before Tuesday, the 22nd inst.

The Corporation do not bind themselves to accept any Tender.

By order,
JNO. MILLS,
Town Clerk.
Town Hall, Chorley,
Oct. 4, 1901.

BOROUGH OF DARWEN.

TENDERS FOR GAS COKE.

THE Corporation of Darwen are pre- pared to receive TENDERS for the purchase of their surplus forked COKE during the next Twelve Months.

The total quantity for which Tenders are asked is about 6000 Tons. The Coke will be delivered in Waggons on the Corporation Gas Siding, or sold as it lies on the Gas-Works Yard.

Sealed Tenders, endorsed "Gas Coke," stating quantity, mode of delivery, and price per ton, must be sent to me on or before Saturday, Oct. 19.

No Tender necessarily accepted.

Further Information may be obtained from the Gas Engineer.

WILLIAM P. HALLIWELL,
Town Clerk.
Town Clerk's Office, Darwen,
Oct. 1, 1901.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the Directors have declared an INTERIM DIVIDEND at the rate of 5 per cent. per annum for the Six Months ending June 30, 1901 (being 5s. per Share), free of Income-Tax, payable on and after the 18th inst.; and Notice is Hereby Further Given to Holders of Share Warrants to Bearer of this Company, that Coupon No. 23 will be Paid by the Company's Bankers, Messrs. Prescott and Co., Ltd., 50, Cornhill, E.C., on and after the 18th day of October, at the rate of 5s. per Coupon. Coupons must be left at the Bankers three clear days for examination.

By order,
J. M. MACMORRAN,
Secretary.

No. 1, East India Avenue,
Leadenhall Street, E.C., Oct. 3, 1901.

INCANDESCENT TRUST, LIMITED.

TAKE NOTICE that, in pursuance with Article 74 of this Company's Articles of Association, we, the undersigned Councillors of the Company, beg to give Notice that an EXTRAORDINARY GENERAL MEETING of the Shareholders of the Company will be held at the Three Nuns Hotel (close to Aldgate Station), on Thursday, the 10th day of October next, at Four o'clock, when the following Resolution will be submitted—namely, "That Messrs. S. J. RISING, J. STEIN, and J. BOEHM be appointed Directors to fill the places vacated on the Board by the request of the Council in accordance with a Resolution dated the 17th day of September, 1901."

Dated this 2nd day of October, 1901.

J. ALTMAN, Chairman.
H. OGUS,
A. ALLWRIGHT, } Councillors.

6, Trinity Square, Tower Hill, E.C.,
Oct. 3, 1901.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF ORDINARY STOCK.

THE Directors have instructed Mr. ROBERT MACK to SELL BY AUCTION, at the Offices of the Company, Newcastle-upon-Tyne, on Wednesday, the 16th day of October, 1901, at Twelve o'clock at noon,

FORTY THOUSAND POUNDS ORDINARY STOCK of the Company, to be issued under the Powers of the Company's Act of 1896.

For Conditions of Sale and further Particulars, apply to the undersigned,

THOS. WADDOM,
Secretary.

Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, Sept. 25, 1901.

By EDWIN FOX and BOUSFIELD,
At the Auction Mart,
On Wednesday, Oct. 16, at Two o'clock, in Lots.

By order of the Directors, and pursuant to the Auction Clauses of the Company's Act of 1899.

WOKING WATER AND GAS COMPANY.

£20,000 NEW CAPITAL, in 2000 £10 ORDINARY SHARES, in Lots of Ten Shares each.

THE Shares form part of an authorized issue of £120,000, have the same powers and privileges, and rank *pari passu* with the existing Capital, now paying a Dividend of £4½ per cent. per annum, and are entitled to a Dividend not exceeding £7 per cent. per annum; thus offering a thoroughly sound and improving Investment.

Particulars of the SECRETARY at the Company's Office, 5 and 6, Great Winchester Street, E.C.; Company's Solicitors, CHARLES A. BANNISTER and REYNOLDS, 70, Basinghall Street, E.C.; and at Messrs. EDWIN FOX and BOUSFIELD'S Office, 99, Gresham Street, Bank, E.C.

NORTH MIDDLESEX GAS COMPANY.

28 £10 ORIGINAL SHARES, Dividend 10 per cent. per annum, and
30 £10 ORDINARY SHARES, Dividend 7 per cent. per annum.

MESSRS. EDWIN FOX & BOUSFIELD will include in their Stock and Share Auction at the Mart, on Wednesday, Oct. 16, at Two o'clock, in Lots, the above Shares.

Particulars at the AUCTIONEERS' OFFICE, 99, Gresham Street, BANK, E.C.

DOVER GAS COMPANY.

IMPORTANT ISSUE OF £10,000 OF NEW STOCK,
UNDER THE PROVISIONS OF THE DOVER GAS ACT, 1901.

MESSRS. WORSFOLD & HAYWARD are favoured with Instructions from the Directors to SELL BY AUCTION, at the Metropole Hotel, Dover, on Thursday, the 17th of October, 1901, at Three o'clock p.m. precisely, in convenient Lots,

£10,000 OF NEW ORDINARY STOCK
IN THE
DOVER GAS COMPANY.

This Stock is in all respects equal to the existing Stock and Shares, which have paid the full Parliamentary Dividend of 7½ per cent. since 1874.

The present price of gas is 2s. 11d. per 1000 cubic feet, whereas the price authorized by the Company's Act is 5s. 3d.; thus giving ample security for the payment of the full Dividend on the increased Capital, apart from the increasing consumption.

Particulars, with Conditions of Sale, may be obtained of the Secretary of the Company, Mr. GEORGE FIELDING, Solicitor, 14, Snargate Street, DOVER; at the COMPANY'S OFFICES, Russell Street, DOVER; and of Messrs. WORSFOLD AND HAYWARD, Auctioneers, Surveyors, and Estate Agents, DOVER and 80, Cannon Street, LONDON, E.C.

ROYAL MASONIC INSTITUTION FOR BOYS.

ELECTION OF TWENTY BOYS FROM A LIST OF FORTY-SEVEN CANDIDATES.

FRIDAY, the 11th of OCTOBER, 1901.

VOTES TO SECURE THE ELECTION OF
WILFRED ALGERNON BURFIELD

WILL be thankfully received by the Secretary of the Evening Star Lodge, No. 1719, Bro. Walter T. Dunn, 47, Fentiman Road, London, S.W., or they may be sent to the Office of the "JOURNAL."

Special attention may be drawn to the following paragraph on the subject, which appeared in the "JOURNAL" for Sept. 10: When subscribers to the Royal Masonic Institution for Boys receive their balloting papers for the October election, they will find the name of Wilfred Algernon Burfield among the accepted candidates. This is the only son of the late Bro. F. G. Burfield, Assistant Secretary of the Tunbridge Wells Gas Company, and previously Secretary to the Gas Institute, who was initiated in the Evening Star Lodge, No. 1719, in June, 1894, and remained a Subscribing Member until his death in December, 1899. His widow, who suffers from an affection of the eyes, is left in such poor circumstances that the Evening Star Lodge have taken up the candidature of her child, to assist in his election into the Institution. The case is strongly recommended.

It may be added that the Candidature is receiving good support; but as it is earnestly desired to secure the election at the first attempt, and about 4500 votes will be required, an urgent appeal is made for assistance.

RAMSGATE CORPORATION.

(WATER DEPARTMENT.)

TENDERS invited for from 450 to 500 18-inch WATER-PIPES.

Tenders to be sent in, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, not later than Ten a.m. on Monday, Oct. 21, endorsed "Tender for Pipes."

The Committee do not bind themselves to accept the lowest or any Tender.

Specification and full Particulars on application to
WILLIAM A. M'INTOSH VALON,
Engineer.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
ILFORD GAS COMPANY.

£10,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PINNER GAS COMPANY, LIMITED.

400 £5 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 500 ORDINARY £10 SHARES
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

1000 £10 NEW ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Oct. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.

165, QUEEN VICTORIA STREET, E.C.;

And at STROUD, GLOUCESTERSHIRE.

NITRATE of Thorium and Cerium, FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

THOMAS DUXBURY & CO., 16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

Prices are Reduced.

TROTTER, HAINES, & CORBETT, LIMITED,

Brettell's Estate

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD STREET, E.C.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD., CHESTERFIELD.

HARDMAN & HOLDEN, LD.

ESTABLISHED 1820.

SULPHURIC ACID.

MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER.

Inquiries Solicited.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

GAS COMPANIES' BOOK-KEEPING.

A PRACTICAL TREATISE ON THE KEEPING OF GAS COMPANIES' ACCOUNTS.

By JOHN HENRY BREARLEY, of Longwood, and BENJAMIN TAYLOR, of Cleethorpes.

The only complete Treatise on Gas Companies' Book-Keeping ever published.

This book will be found invaluable to those desirous of obtaining a thorough grasp of Gas Companies' Book-Keeping and Accountancy.

A complete set of Transactions are dealt with; the same being entered into the various Books, and posted into the Ledgers. A Model Balance-Sheet is prepared from the set of transactions and postings.

Forms and subsidiary books are illustrated and described. The linking together of the various books is shown at a glance by means of a Chart.

OPINIONS OF THE PRESS.

The Accountant.—"No pains have been spared by the authors to make this book complete in every respect. The system of accounts recommended is not only a model of clearness, but also fully adequate to meet all reasonable requirements. Generally the get-up of the book, and of the various forms and specimen rulings shown therein, is excellent. The work will be found both useful and reliable, while its convenience is greatly enhanced by the inclusion of an adequate index."

Gas Engineer's Magazine.—"It is difficult to speak too highly of the clearness in which the authors have set down every detail. The 'Model set of Books' appear to us to be about as complete as experience and careful thought can make them. The authors have placed within the reach of every official of a Gas Undertaking, a book that we venture to prophesy will become a standard work, and will prove the guide, philosopher, and friend of all those who are engaged in the keeping of gas-works accounts."

Leeds Mercury.—"The explanatory remarks are given in language that cannot be misunderstood."

NET PRICE: CLOTH BOUND, 12s. 6d.; MOROCCO GILT, 18s.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

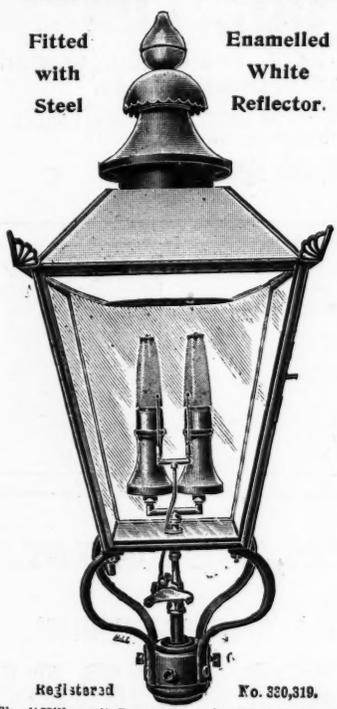
MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

THE

"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



Registered No. 330,319.

The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

H. GREENE & SONS, LTD.
Late of Cannon Street,
Works and Show Rooms:
19, Farringdon Road, E.C.
Registered Offices:
36, Mark Lane, E.C.
Telephone: 2669 AVENUE. Telegrams: "LUMINOSITY."

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED,
DARLINGTON.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

HYDRAULIC BLOWER

For blowing Air into Gas Purifiers for the purpose of

REVIVIFYING THE FOULED OXIDE.

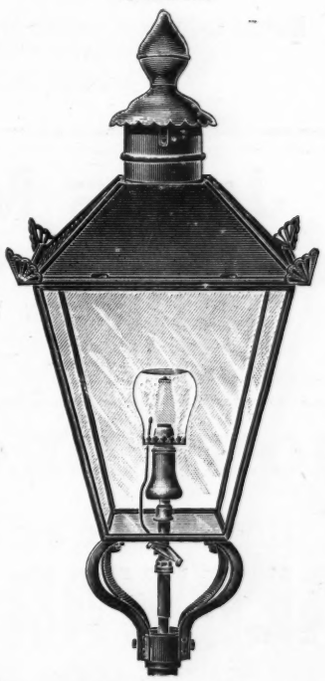
Full Particulars on application.

LUXWERKE LUDWIGSHAFEN AM RHEIN.

THE

"ST. HELENS" LANTERN

Fitted with Steel Enamelled White Reflector.



A. E. PODMORE & CO.,

GAS LIGHTING ENGINEERS AND CONTRACTORS,
25A, HATTON GARDEN, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

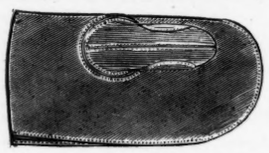
WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

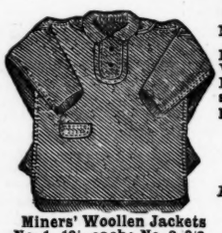
THE
Berlin Incandescent Gaslight Co., m.b.h.
(RICHARD FEUER)
BERLIN-SCHÖNEBERG, BAHNSTRASSE, 22,
IS THE
Largest Manufactory on the Continent for first-class
MANTLES.

Latest Novelty:
Reme Silk Mantles
(Equal Light during 1000 Hours).
Cotton Mantles.
The Cheapest Intensive Burner.

THOMAS BUGDEN, MANUFACTURER OF
TAR and LIQUOR HOSE, and Special AIR TUBING.



BELLOWS made to inflate a 48-inch Bag under One Minute. Various sizes made.



Stokers' Mitts, from 13/6 doz.
Made from best Tanned Leather.
India-rubber Hose, Sheet, and Washers of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats, Capes, Sewer Boots, and Theatrical Dresses.
Fire-Engine Hose and Appliances.
Best Materials and Workmanship Guaranteed.

Miners' Woollen Jackets
No. 1, 12/- each; No. 2, 9/6.
Gas-Bags for Mains
Gas-Engine Bags.
71, GOSWELL ROAD, E.C.

THE WIGAN COAL & IRON CO., LIMTD.,
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.
Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.
London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "PARKER, LONDON."

JAMES MILNE & SON, LTD.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·80.
VERY FREE FROM IMPURITIES.
TELEGRAMS: "ATLAS SHEFFIELD."

THE CLAMOND GAS RADIATOR

The application to Gas-Stoves of the well-known

KERN BURNER PRINCIPLE.

The perfection of Gas-Fires.

THE CLAMOND GAS RADIATOR

1. Gives the **HIGHEST HEATING EFFICIENCY.**
2. Ensures **PERFECT COMBUSTION.**
3. Does not vitiate the Atmosphere.
4. It is easy to manipulate, and has no parts to get out of order.

ORDER THE CLAMOND GAS RADIATOR.

Because

It keeps a Pure Atmosphere in your Room.

Because

It keeps your Rooms free from Dirt, Dust, and Smoke.

Because

It is Cheaper than a Coal Fire.

Because

It makes a Bright, Cheerful Fire.

Because

It saves Labour, Money, and Health.

THE CLAMOND GAS RADIATOR

THE PERFECTION OF GAS HEATING.

THE CLAMOND GAS RADIATOR

Is supplied in various Sizes and Styles.

THE CLAMOND GAS RADIATOR

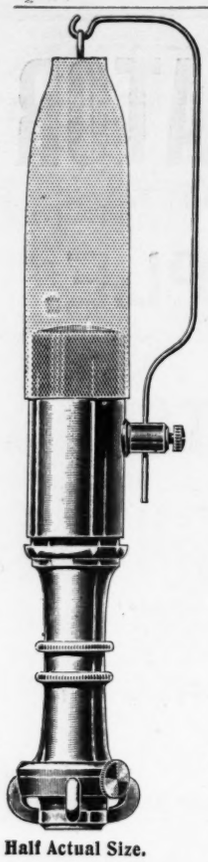
Is suitable for the COTTAGE or the PALACE.

ILLUSTRATED CATALOGUE POST FREE ON APPLICATION TO

THE KERN BURNER COMPANY, LIMITED,

GRAVEL LANE, SOUTHWARK STREET, LONDON, S.E.

INSPECTION INVITED.



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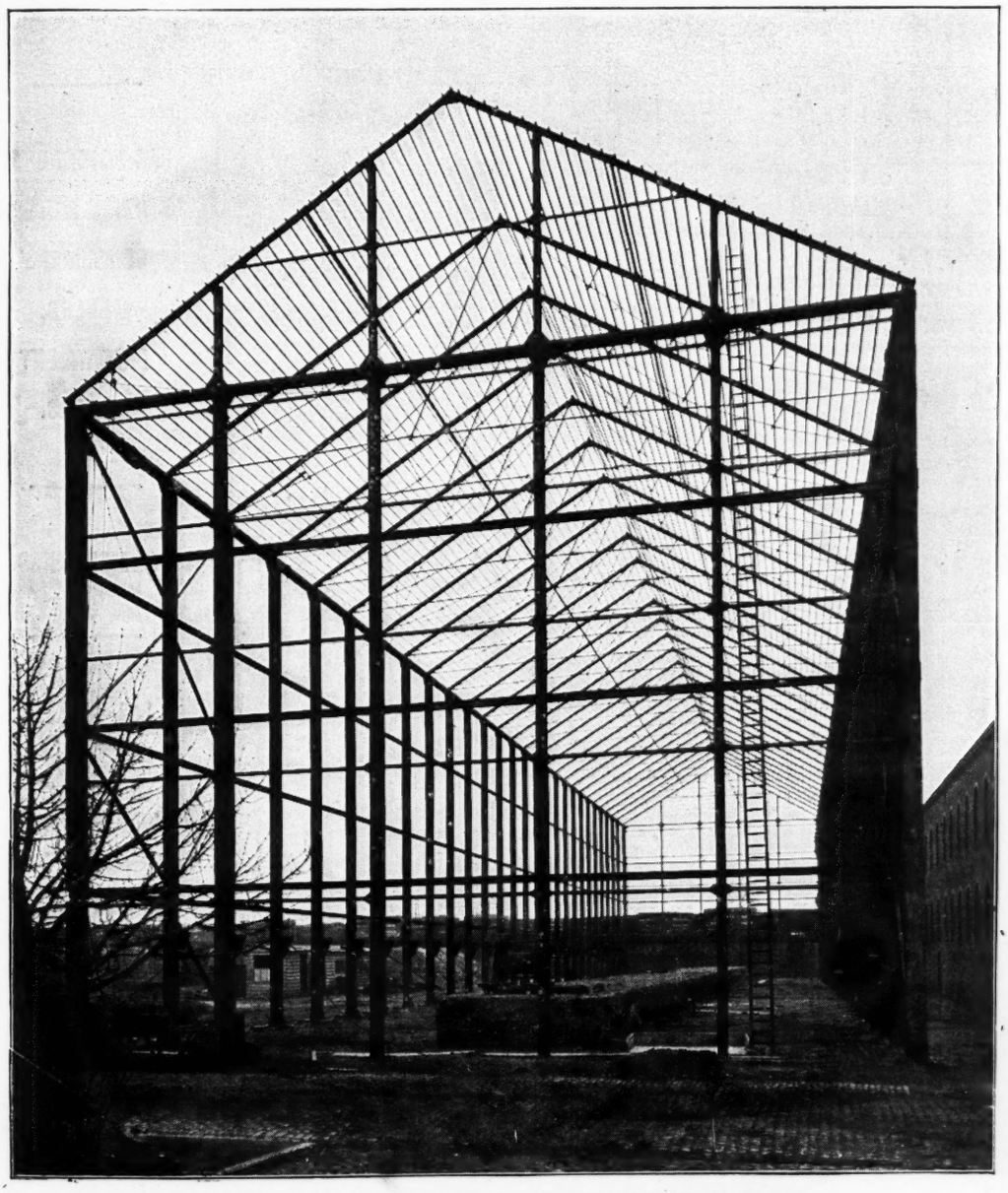

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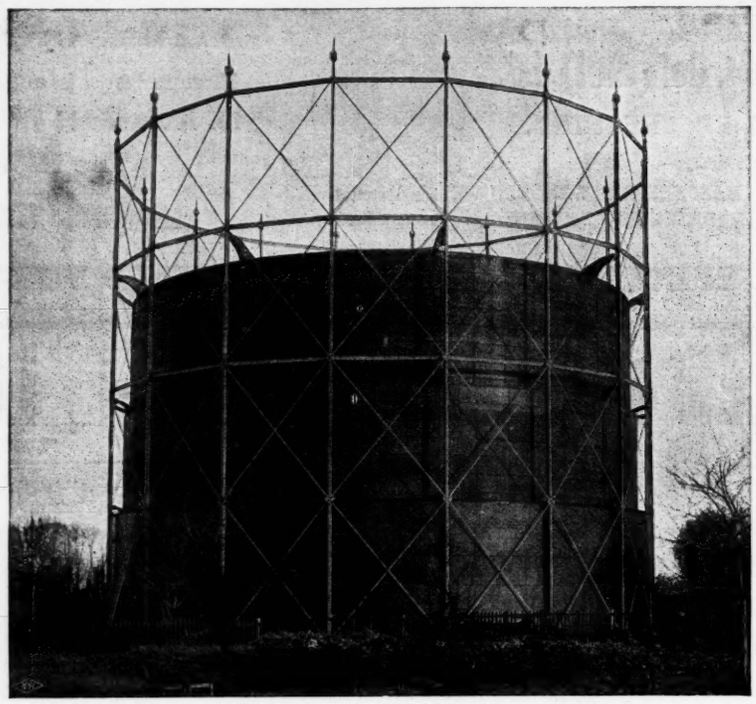
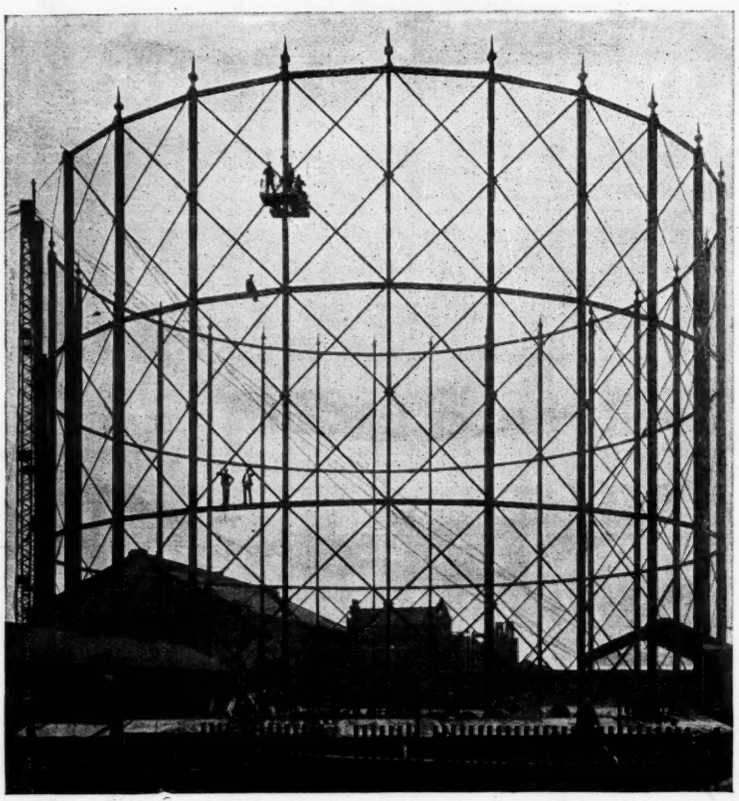


Three-Lift Gasholder and Steel Tank, 90 feet diameter by 14 feet deep, recently erected for the EPSOM GAS COMPANY.



Three-Lift Gasholder, 145 feet diameter by 35 feet deep, in course of construction for the WANDSWORTH & PUTNEY GAS COMPANY.

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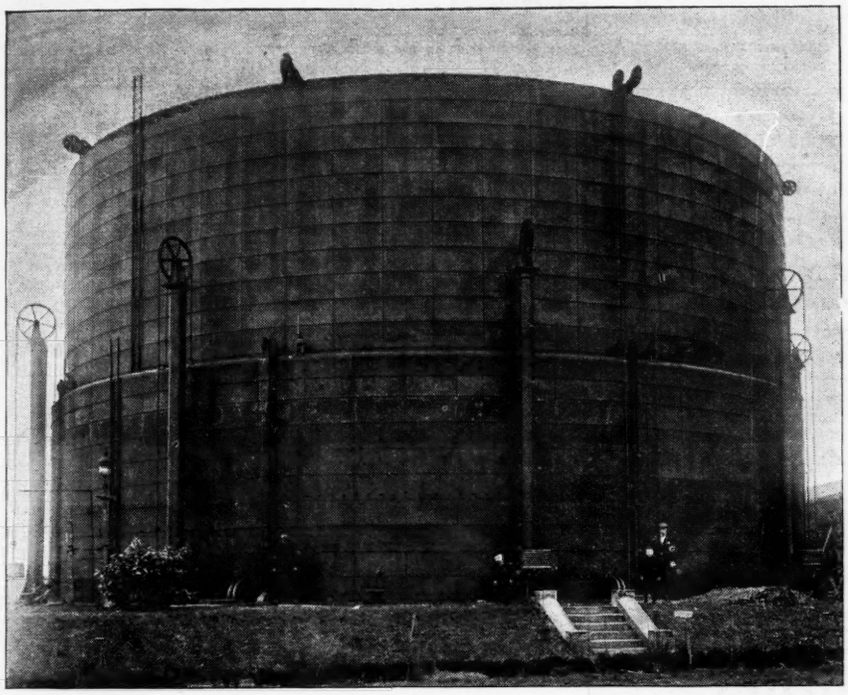

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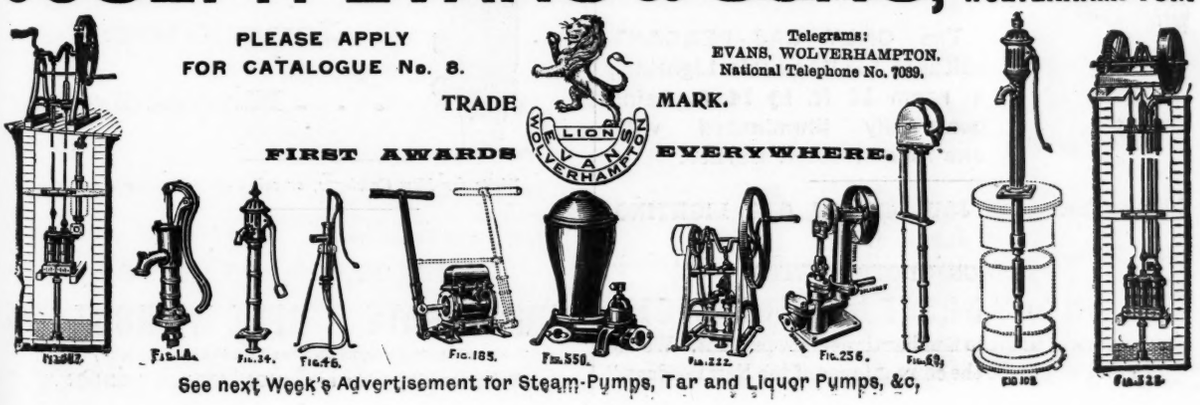

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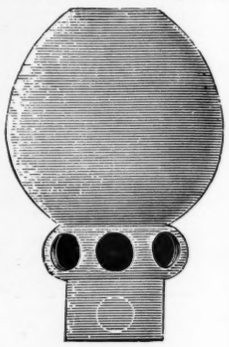

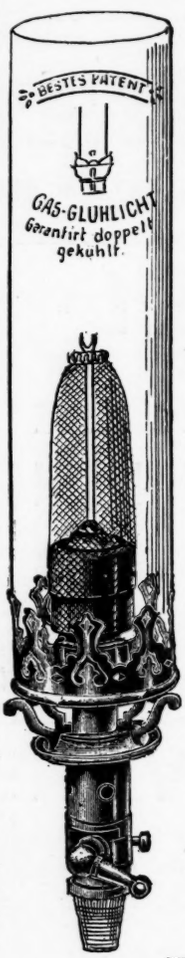

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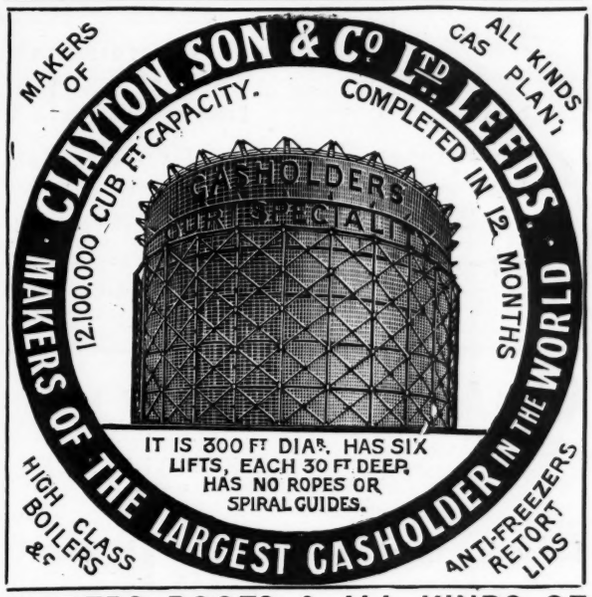
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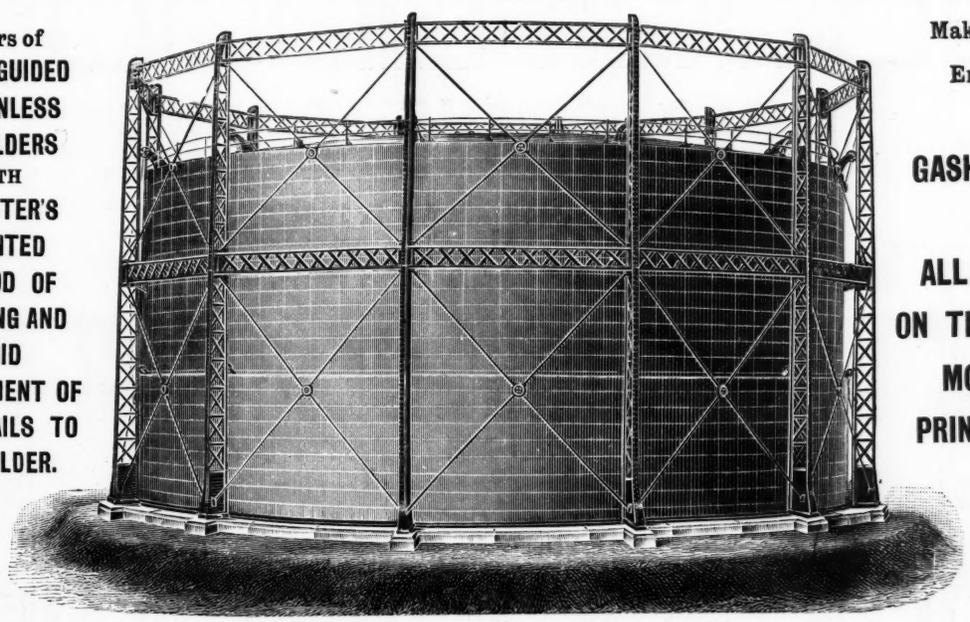

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